STOPPING WATER POLLUTION AT ITS SOURCE

MISA

Municipal/Industrial Strategy for Abatement

DRAFT DEVELOPMENT DOCUMENT FOR THE PULP AND PAPER SECTOR EFFLUENT LIMITS REGULATION

Ontario
Environment
Environnement

ISBN 0-7778-0837-4

DRAFT DEVELOPMENT DOCUMENT FOR THE PULP AND PAPER SECTOR-- EFFLUENT LIMITS REGULATION

Report prepared by:

Water Resources Branch
Ontario Ministry of the Environment

JANUARY 1993

Cette publication technique
n'est disponible qu'en anglais.

PIBS 2263

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

PREFACE

The Municipal-Industrial Strategy for Abatement (MISA) program was officially announced by the Ontario Ministry of the Environment in June 1986. MISA is a regulatory program for reducing water pollution from both industrial and municipal dischargers. The ultimate goal of MISA is the virtual elimination of persistent toxic contaminants from all discharges into Ontario's waterways.

Under the MISA program for the pulp and paper sector, technology-based effluent limits are being imposed on each direct discharge pulp and paper mill as a minimum pollution control requirement. In addition, more stringent effluent limits may be imposed on a site-specific basis in order to provide added protection to sensitive receiving watercourses.

The MISA program to develop technology-based effluent limits for the pulp and paper sector involved two phases. In the first phase, an effluent monitoring regulation was promulgated in 1989 requiring direct discharge pulp and paper mills to monitor their point source effluents at regular intervals according to specified sampling and analytical protocols and procedures. In the second phase, effluent limits were developed based on the effluent monitoring data and on best available technology (BAT).

This document describes the steps involved in the development of effluent limits and contains the technical rationale used. This development document is comprised of six chapters.

Chapter one is introductory and presents a short summary of the MISA program along with a description of the effluent limits regulation development process. The main features of the effluent limits regulation are also described.

Chapter two presents information about the pulp and paper sector. The sector currently consists of twenty-six direct discharge pulp and paper mills, nine of which are kraft mills, seven are sulphite-mechanical mills, two are corrugating mills and the remaining eight are deinking-board-fine papers-tissue mills. Information about each mill is given, including mill location, product, number of employees, production processes and capacities, in-plant and external pollution controls and the composition and toxicity of mill effluents.

Chapter three describes the pulp and paper sector pre-regulation effluent monitoring program and the one year of regulated effluent monitoring under MISA. The selection of the candidate parameters for effluent limits setting and the quality assurance/quality control assessment of the data for each parameter are also discussed

Chapter four describes the assessment of the available pollution control technologies and describes those technologies considered to be the "best available". Chapter four also examines the implementation costs of the "best available" technologies and identifies the preferred BAT technology train option for the pulp and paper sector.

Chapter five describes the selection of the limited parameters and describes the effluent limits setting process. Each step in the effluent limits setting process is documented and the method for calculating effluent limits is explained. Loading reductions are also discussed along with a comparison of the effluent limits with those of other jurisdictions.

Chapter six presents a summary of the key components of the effluent limits regulation. Compliance requirements and monitoring frequencies are defined, as well as other regulation requirements such as toxicity testing, flow measurement and reporting.

The draft effluent limits regulation for the pulp and paper sector is presented in Appendix I and a summary of the effluent monitoring data is presented in Appendix II.

The draft effluent limits regulation for the pulp and paper sector is the result of the joint effort of the Ontario Ministry of the Environment, Environment Canada, the Ontario Pulp and Paper Industry and the MISA Advisory Committee (MAC). The draft regulation is being released for a sixty day public review period in order to fully solicit public input and comment as part of the consultative process under which the draft regulation has been developed.

EXECUTIVE SUMMARY

This document describes the steps involved in the development of effluent limits for the pulp and paper sector.

Under the effluent monitoring regulation for the pulp and paper sector, discharge mills were required to conduct one year of comprehensive effluent monitoring starting on January 1, 1990. Up to 135 parameters were monitored on a daily, thrice weekly, weekly, monthly, bi-monthly and semi-annual basis.

In total 191,932 pieces of data were collected including 46,646 pieces of quality assurance and quality control data. The effluent monitoring data were used to select candidate parameters for effluent limits setting. A parameter was selected for effluent limits setting if the effluent monitoring data for any process effluent showed, at a 95% confidence level, that 10% or more of the data for that parameter and for that effluent were at concentrations greater than or equal to the parameter's regulation method detection limit.

Seventy-seven parameters were selected as candidate parameters for effluent limits setting for mills in the sulphate (kraft) category, 43 parameters were selected for mills in the sulphite-mechanical category, 38 parameters were selected for mills in the corrugating category and 49 parameters were selected for mills in the deinking/board/fine papers/tissue category. A parameter was selected for a mill category if it was selected at one mill in the category.

Quality assurance/quality control (QA/QC) data were examined in order to determine whether the effluent monitoring data for the candidate parameters selected for effluent limits setting, were acceptable for use in the development of effluent limits. Parameters were removed from further consideration if the QA/QC data assessment showed that their presence in the effluent was highly suspect or if the effluent monitoring data were of limited quality or unreliable quality for effluent limits setting.

The parameters removed from further consideration because the QA/QC data assessment showed that their presence in mill effluent was highly suspect, included 20 parameters from the sulphate (kraft) category, 10 parameters from the sulphite-mechanical category, 1 parameter from the corrugating category and 4 parameters from the deinking/board/fine papers tissue category.

The parameters that were removed from further consideration because the effluent monitoring data were of limited quality or unreliable quality for effluent limits setting included 3 parameters from the sulphate (kraft) category, 3 parameters from the sulphite-mechanical category, 9 parameters from the corrugating category and 2 parameters from the deinking/board/fine papers tissue category.

Following the selection of the candidate parameters for effluent limits setting and the QA/QC data assessment, the Ministry hired a consultant to develop inventories of available pollution control technologies for the pulp and paper sector and the current pollution control technologies used by Ontario pulp and paper mills. From the list of available technologies, the consultant was asked to identify "best available" technologies that could be applied to Ontario mills and to assess technical feasibility, capital costs, operating expenditures and resulting effluent quality if these technologies were retrofit at Ontario mills.

The consultant identified five BAT technology trains for the sulphate (kraft) mills, three technology trains for the sulphite-mechanical mills and corrugating mills and four technology trains for the deinking/board/fine papers/tissue mills.

The five BAT technology trains (K1 to K5) identified for sulphate (kraft) mills consist of a combination of in-plant control measures for pollution prevention at source and external treatment technologies. All of the technology trains include provisions for internal spill control, improved pulp washing prior to bleaching, biological treatment of mill effluent and emergency spill containment. Technology train K1 includes high chlorine dioxide substitution for elemental chlorine while technology trains K2 to K5 include 100% chlorine dioxide substitution for elemental chlorine. Technology train K3 includes oxygen delignification and technology train K4 includes extended cooking while technology train K5 includes both oxygen delignification and extended cooking.

The three BAT technology trains (S1/C1 to S3/C3) identified for sulphite-mechanical mills and corrugating mills consist of biological treatment of mill effluent with additional provision for granular filtration in technology trains S2/C2 and chemically-aided coagulation in technology trains S3/C3.

The four BAT technology trains (F1 to F4) identified for deinking/board/fine papers/tissue mills are similar to those identified for the sulphite-mechanical and corrugating mills. Technology train F1 consists of aerated stabilisation basin treatment while technology trains F2 to F4 consist of activated sludge effluent treatment with provision for granular filtration in technology train F3 and chemically-aided coagulation in technology train F4.

In order to develop effluent limits based on the BAT technology trains, the Ministry conducted an economic assessment of the costs of imposing the identified BAT technology trains on the pulp and paper sector. Different technology train combinations were evaluated in order to determine the most cost-effective control option. The most cost-effective control option is the combination of technology trains that results in the lowest cost per unit of pollutant removed and the lowest ratio of the average incremental cost per additional unit of pollutant removed.

The most cost-effective control option for the pulp and paper sector consisted of:

- technology train K2 for sulphate (kraft) mills
- technology train S1 for sulphite-mechanical mills
- technology train C1 for corrugating mills
- technology train F1 for deinking/board/fine papers/ tissue mills

Implementation of these technology trains could cost the pulp and paper sector as much as $583 million in capital costs and $54 million per year in operating costs. Over a ten year period these costs could represent an annualized after-tax expenditure of $94 million per year. Based on a review of the technical information and on the results of the economic assessment, the Ministry concluded that the most cost-effective control option, technology trains K2, S1, C1 and F1, was the preferred BAT technology train option for the pulp and paper sector.

Following the identification of the preferred BAT technology train option, the candidate parameters selected for effluent limit setting were further evaluated in order to determine those parameters for which technically defendable effluent limits could be developed. Sixty parameters were removed from further consideration because they could not be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

Daily and monthly average production-based loading limits were developed for the remaining seven parameters based on BAT plant performance data. Production-based limits were developed for:

- biochemical oxygen demand (BOD)
- total suspended solids (TSS)
- adsorbable organic halide (AOX)
- total phosphorus
- chloroform
- toluene
- phenol

Plant specific loading limits were then calculated for each parameter and for each mill by multiplying the daily and monthly average production-based loading limits by the reference production rate for the mill. The reference production rate is the production rate that was exceeded on only 10% of the days that the mill operated during the first six months of 1990.

In addition to the plant specific loading limits, the following general requirements apply to all of the mills:

- mills must not discharge measurable concentrations of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF)

- mills must not discharge effluent acutely lethal to rainbow trout and *Daphnia magna* (water fleas)

- mills must conduct chronic toxicity testing following twelve consecutive months of non-lethal acute lethality test results.

- mills must discharge effluent within the pH range 6.0 to 9.5.

Pulp and paper mills will have up to three years to comply with these requirements which will allow the mills sufficient time to implement the necessary pollution prevention and control strategies and install the necessary capital equipment.

In order to comply with the proposed limits, the pulp and paper sector will have to reduce BOD discharges by 84% (287,249 kg/day) which is roughly equivalent to the amount of raw sewage generated by 3.2 million people. TSS discharges will have to be reduced by 5% (4,948 kg/day) which is onerous in that all of the mills in Ontario already have treatment in place for TSS removal.

AOX discharges will have to be reduced by 52% (8,086 kg/day) by December 31, 1995 and by 74% (11,539 tonnes/day) by December 31, 1999. Mills are also being asked to achieve the goal of zero AOX discharge by December 31, 2002. When the goal of zero AOX discharge is achieved, over 15,000 kg/day of AOX will have been removed from effluent discharges to the environment.

Compliance with the proposed BOD limits may result in a 16% (133 kg/day) increase in the amount of total phosphorus discharged to the environment because total phosphorus is added as a nutrient to biological treatment systems in order to maximize BOD removal. While the limits for total phosphorus are based on the International Joint Commission recommended monthly discharge limit of 1 mg/litre, the amount of total phosphorus discharged by the sector may increase due to the large number of mills that will have to install new biological treatment systems in order to meet the BOD limits.

The discharges of chloroform, phenol and toluene will also be greatly reduced by compliance with the proposed limits. Chloroform discharges will be reduced by 96% (435 kg/day), toluene discharges by 83% (3.4 kg/day) and phenol discharges by 88% (22.2 kg/day).

The proposed effluent limits for the pulp and paper sector represent a significant step forward in the overall protection of human health and aquatic life in Ontario and are a major step forward towards the Ministry's goal of the virtual elimination of persistent toxic substances.

THE MISA INITIATIVE

CHAPTER 1

OF THE

DEVELOPMENT DOCUMENT

TABLE OF CONTENTS

1.1 THE MISA PROGRAM

The Municipal-Industrial Strategy for Abatement (MISA) program was officially announced by the Ontario Ministry of the Environment in the White Paper of June 1986[1]. MISA is a regulatory program for reducing water pollution from both industrial and municipal dischargers. The ultimate goal of MISA is the virtual elimination of persistent toxic contaminants from all discharges into Ontario's waterways.

Under the MISA program for the pulp and paper sector, technology-based effluent limits are being imposed on each direct discharge pulp and paper mill as a minimum pollution control requirement. In addition, more stringent effluent limits may be imposed on a site-specific basis in order to provide added protection to sensitive receiving waterbodies.

The MISA program to develop technology-based effluent limits for the pulp and paper sector involved two phases. In the first phase, an effluent monitoring regulation was promulgated in 1989 requiring direct discharge mills to monitor their point source effluents at regular intervals according to specific sampling and analytical protocols and procedures. In the second phase, effluent limits were developed based on the effluent monitoring data and on best available technology (BAT).

The effluent limits regulation for the pulp and paper sector has been developed in consultation with industry and the public. Consultation has been facilitated through the pulp and paper sector Joint Technical Committee (JTC), made up of representatives from the Ministry, Environment Canada, the affected dischargers and the MISA Advisory Committee. Public consultation is being facilitated through a sixty day public review and comment period.

The Ministry is committed to keeping abreast of available pollution prevention technology and the effluent limits regulation for the pulp and paper sector will be reviewed at regular time periods and amended as new developments take place. Through this process of ongoing evaluation and step-by-step reductions, MISA's ultimate goal to virtually eliminate the discharge of toxic contaminants will be achieved for this sector. Such a goal fulfils Ontario's commitment to the protection and improvement of our natural water resources, and is consistent with the provisions of the Canada-Ontario Agreement Respecting Great Lakes Water Quality[2] and the Canada-United States Great Lakes Water Quality Agreement[3].

1.2 THE EFFLUENT LIMITS REGULATION DEVELOPMENT PROCESS

In 1989, the Ministry initiated the MISA Issue Resolution Process in order to establish standard procedures and criteria for the development of consistent and equitable effluent limits regulations. Special working groups called Issue Resolution Committees (IRCs) were formed. The working groups included representatives from the Ministry, industry and municipalities. Environment Canada and the MISA Advisory Committee were asked to comment on the proposed effluent limits development process and their comments and concerns were carefully assessed during the decision-making process.

The general process described in the IRC final report summary[4] and the IRC report[5] was followed in developing the effluent limits regulation for the pulp and paper sector. This process consisted of the following basic steps:

STEP 1: EFFLUENT MONITORING

Under the effluent monitoring regulation for the pulp and paper sector[6], direct dischargers were required to conduct one year of effluent monitoring for a comprehensive list of contaminants. Up to 135 parameters were monitored on a daily, thrice weekly, weekly, monthly, bi-monthly and semi-annual basis for process effluent, cooling water effluent, storm water effluent, emergency overflow effluent, backwash effluent and waste disposal site effluent.

STEP 2: CANDIDATE PARAMETER SELECTION

Statistical tests were applied to the effluent monitoring data to determine candidate parameters for effluent limits setting. A parameter was selected for effluent limits setting if the effluent monitoring data for any process effluent showed, at a 95% confidence level, that 10% or more of the data for that parameter and for that effluent were at concentrations greater than or equal to the parameter's regulation method detection limit.

STEP 3: QA/QC DATA ASSESSMENT

Quality assurance/quality control (QA/QC) data were used to evaluate the suitability of the effluent monitoring data for use in the effluent limits setting process. Data which were considered suspect or unreliable were eliminated from further consideration.

STEP 4: BEST AVAILABLE TECHNOLOGY (BAT) IDENTIFICATION

Available pollution control technologies were identified and screened on the basis of the number, kind and toxicity of the contaminants treated and the contaminant reductions achieved. Best available technologies were identified from the list of available technologies according to the criteria outlined in the Issue Resolution Committee Report on Best Available Technology[7].

Best available technologies were grouped together to form technology trains representing different levels of pollution control and abatement. BAT technology trains were reviewed in order to identify the contaminants that would be treated if they were retrofit at Ontario mills, the retrofit costs and the contaminant discharge levels that would result.

STEP 5: ECONOMIC ASSESSMENT

The costs of the various BAT technology trains and information about the estimated pollutant removal efficiencies of each train were used to derive abatement cost functions which indicated the relationship between increasingly stringent levels of control and the costs of achieving them. The financial and economic consequences associated with imposing the different levels of control were used to determine the preferred control option for the pulp and paper sector.

STEP 6: EFFLUENT LIMITS SETTING

Effluent limits were developed using the performance data from mills with BAT treatment following the general procedures outlined in the Issue Resolution Committee reports on Monitoring Data Analysis and Limit Setting and Form of Limits[8].

1.3 THE EFFLUENT LIMITS REGULATION FOR THE PULP AND PAPER SECTOR

The effluent limits regulation for the pulp and paper sector[9] specifies all of the legal discharge requirements that each pulp and paper mill must meet. The requirements are related to the quality and quantity of effluent discharges, toxicity testing, flow measurement and reporting.

The effluent limits regulation states that:

- mills must comply with specified daily and monthly average allowable discharge limits for the parameters biochemical oxygen demand (BOD), total suspended solids (TSS), adsorbable organic halide (AOX), total phosphorus, chloroform, toluene and phenol.

- mills must not discharge measurable concentrations of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF)

- mills must not discharge effluent acutely lethal to rainbow trout and Daphnia magna (water fleas)

- mills must conduct chronic toxicity testing following twelve months of non-lethal acute lethality test results

- mills must discharge effluent between the pH range 6.0 to 9.5

The effluent limits regulation will be promulgated under Section 136 of the Ontario Environmental Protection Act and will require pulp and paper mills to achieve regulatory compliance within three years of the promulgation date of the regulation. This will allow the mills sufficient time to implement the necessary pollution prevention and control strategies and to install the necessary capital equipment.

1.4 REFERENCES

1. Ontario Ministry of the Environment (1986). Municipal-Industrial Strategy for Abatement (MISA). A Policy and Program Statement of the Government of Ontario on Controlling Municipal and Industrial Discharges into Surface Waters. Toronto, Ontario. June 1986.

2. Canada-Ontario Agreement respecting Great Lakes Water Quality. March 1986.

3. International Joint Commission (1978). Great Lakes Water Quality Agreement, with annexes and terms of reference between the United States and Canada. Ottawa, Ontario. November 1978.

4. Ontario Ministry of the Environment (1991). MISA Issues Resolution Process Final Report Summary. Toronto, Ontario. September 1991.

5. Ontario Ministry of the Environment (1990). MISA Issues Resolution Process - Issue Resolution Committee Reports. Toronto, Ontario. June 1990.

6. Government of Ontario (1989). Ontario Regulation 435/89 as amended to Ontario Regulation 202/90 under the Environmental Protection Act -- Effluent Monitoring - Pulp and Paper Sector. Toronto, Ontario. May 1990.

7. Ontario Ministry of the Environment (1990). MISA Issues Resolution Process - Issue Resolution Committee Reports. Toronto, Ontario. June 1990.

8. Ontario Ministry of the Environment (1990). MISA Issues Resolution Process - Issue Resolution Committee Reports. Toronto, Ontario. June 1990.

9. Government of Ontario (1992). Ontario Regulation ???/92 under the Environmental Protection Act -- Effluent Limits - Pulp and Paper Sector. Toronto, Ontario. ????? 1992.

THE PULP AND PAPER SECTOR

CHAPTER 2

OF THE

DEVELOPMENT DOCUMENT

TABLE OF CONTENTS

LIST OF TABLES

2.1 THE PULP AND PAPER INDUSTRY IN ONTARIO

In 1990, there were twenty-seven pulp and paper mills located in the Province of Ontario that discharged effluent directly to surface watercourses. Sixteen mills were located in Northern Ontario, five in Eastern Ontario and the remaining six in South-Central Ontario. One of the mills, Abitibi-Price (Thunder Bay) has since closed but the others continue to operate.

In 1990, Ontario pulp and paper mills produced about six million tonnes of saleable pulp and paper products while employing approximately 17,000 people in the province. In terms of employment, the pulp and paper industry was the fifth leading manufacturing industry in Ontario behind motor vehicle parts, motor vehicles, primary steel and electronic equipment. When resource jobs (woodlands, harvesting and management) were included the Ontario pulp and paper industry directly employed approximately 75,000 people[1]. Table 2.1 lists the twenty-seven mills, the products produced and the approximate number of employees at each mill during the 1990 MISA effluent monitoring period.

2.2 PRODUCTION PROCESSES

Pulp is an intermediate product used in the manufacture of paper and paper products and it is manufactured by a number of different processes which generate wastewater effluents with varying characteristics. Traditionally, pulping processes have been divided into chemical pulping processes and mechanical pulping processes. For the sake of simplicity, only the main pulping processes used in Ontario are discussed in this development document. More detailed information can be found in the report on Best Available Technology for the Ontario Pulp and Paper Industry[2].

CHEMICAL PULPING PROCESSES

In chemical pulping processes, wood fibres are separated by breaking down the lignin bonds between the fibres with chemical reactants. Up to 60% of the mass of the wood can be converted into soluble organics by the process so that the yield of pulp can be as low as 40%. The two main chemical pulping processes used in Ontario are the sulphate (kraft) process and the sulphite process.

Table 2.1
The Pulp and Paper Sector (1990)

Plant Name	Product	Tonnes/Year	Employees
Abitibi-Price (Fort William)	Newsprint	142,350	300
Abitibi-Price (Iroquois Falls)	Newsprint	321,200	900
Abitibi-Price (Provincial Papers)	Fine Papers	182,500	250
Abitibi-Price (Thunder Bay)	Newsprint	167,900	325
Beaver Wood (Thorold)	Paperboard	107,310	160
Boise Cascade (Fort Frances)	Kraft Pulp/Groundwood Specialties	355,875	1,000
Boise Cascade (Kenora)	Newsprint	346,750	850
CP Forest Products (Dryden)	Kraft Pulp/Fine Papers	365,000	1,030
CP Forest Products (Thunder Bay)	Kraft Pulp/Newsprint	930,385	2,033
Domtar (Cornwall)	Fine Papers	301,125	1,450
Domtar (Red Rock)	Linerboard/Newsprint	328,500	650
Domtar (St. Catharines)	Fine Papers	73,000	300
Domtar (Trenton)	Corrugating Medium	123,370	140
E.B. Eddy (Espanola)	Kraft Pulp/Fine Papers	332,150	600
E.B. Eddy (Ottawa)	Fine Papers	62,050	600
James River-Marathon (Marathon)	Kraft Pulp	182,500	380
Kimberly-Clark (Huntsville)	Tissue	33,580	250
Kimberly-Clark (St. Catharines)	Tissue/Fine Papers	43,800	200
Kimberly-Clark (Terrace Bay)	Kraft Pulp	438,000	730
MacMillan-Bloedel (Sturgeon Falls)	Corrugating Medium	129,575	420
Malette (Smooth Rock Falls)	Kraft Pulp	117,165	300
Noranda Forest Products (Thorold)	Fine Papers	116,800	625
Quebec & Ontario (Thorold)	Newsprint	317,915	1,150
St. Marys Paper (Sault Ste. Marie)	Groundwood Specialties	200,750	520
Sonoco (Trenton)	Paperboard	118,625	279
Spruce Falls (Kapuskasing)	Newsprint	365,000	1,200
Strathcona (Napanee)	Boxboard	123,370	160
Total		6,326,545	16,802

The Sulphate (Kraft) Process

The sulphate (kraft) process is the dominant chemical pulping process used in Ontario and in the rest of the world because of the high strength pulp that it produces. Kraft pulp is produced by cooking wood chips at elevated pressure and temperature in a digester with a strong alkali solution. The alkali solution, generally referred to as white liquor, is typically 10% sodium sulphide and sodium hydroxide.

Spent cooking liquors (known as black liquor) are separated from the kraft pulp following cooking in the digester and are treated in a chemical recovery system. The recovery system regenerates the cooking chemicals of sodium sulphide and sodium hydroxide while utilizing the heat value of the organic residue to generate steam for the process[3].

Kraft pulp is usually bleached by molecular chlorine, chlorine compounds and related chemicals and then dried for sale or used on site for papermaking.

The Sulphite Process

In the sulphite pulping process, wood fibres are separated by the action of sulphur dioxide and a metallic base under pressure and at elevated temperature. Most sulphite mills use a soluble chemical base like sodium which permits spent liquor recovery or incineration.

Sulphite pulps are used to produce many types of paper including newsprint, tissue and writing papers.

MECHANICAL PULPING PROCESSES

In mechanical pulping processes, wood fibres are separated by the application of mechanical energy under wet conditions. The fibres are literally torn apart, one from the other. In true mechanical pulping only about 5% of the weight of the original wood is lost as dissolved organics and a few percent rejected in solid form so that product yields are typically 90 to 96%. The most popular mechanical pulping processes used in Ontario are stone groundwood (SGW) pulping and thermomechanical pulping (TMP).

The Stone Groundwood Process

The stone groundwood (SGW) process was the earliest form of mechanical pulping used commercially and is the most extensively used mechanical pulping process in Ontario. Logs are forced into contact with a revolving grindstone in the presence of water to reduce the wood to a macerated fibrous condition. The applied water cools, cleans, and lubricates the stone and conveys the pulp away from the stone. Groundwood pulp is used mainly in the manufacture of newsprint.

The Thermomechanical Process

Thermomechanical pulp (TMP) is produced by passing wood chips through a disk refiner which consists of two serrated plates, one or two of which are rotating. TMP refiners generally operate under pressure at temperatures over 100 degrees celsius. The process requires twice as much power as the stone groundwood process but produces a wood pulp with better mechanical properties. Thermomechanical pulp, like stoneground wood pulp, is used mainly in the manufacture of newsprint.

2.3 INDUSTRY CATEGORIES AND WASTEWATERS GENERATED

Under the effluent monitoring regulation for the pulp and paper sector, the twenty-seven direct discharge mills were divided into four categories: sulphate (kraft), sulphite-mechanical, corrugating and deinking/board/fine papers/tissue. Mills were placed into a particular category depending on the manufacturing processes used at the mill. Tables 2.2 to 2.5 present the four categories along with information on the mills in each category.

In 1990, the twenty-seven mills discharged on average 340,000 kg/day of BOD, 97,100 kg/day of TSS and 15,600 kg/day of AOX. Total process effluent flow was approximately 1,380,000 m^3/day. Mill effluent was acutely lethal to rainbow trout in 65% (180/278) of the process effluent samples that were collected and acutely lethal to Daphnia magna in 54% (164/304) of the process effluent samples that were collected. Tables 2.6 to 2.9 present summary data for each mill and for each category of mill.

Table 2.2
The Sulphate (Kraft) Category

Plant Name	Process	Product	In-Plant Control	External Treatment	Discharge
Boise Cascade (Fort Frances)	Bleached kraft pulp Groundwood pulp	Market kraft pulp Groundwood specialty paper	Dry debarking Closed screen room 7% ClO_2 substitution	Wet woodroom clarifier Paper mill clarifier 2 settling basins Aerated stabilisation basin	Rainy River
CPFP (Dryden)	Bleached kraft pulp	Market kraft pulp Fine paper	Dry debarking Spill recovery system Spill diversion system	Primary clarifier Aerated stabilisation basin with jet aeration	Wabigoon River to the Winnipeg River
CPFP (Thunder Bay)	Bleached kraft pulp Groundwood pulp Thermomechanical pulp	Market kraft pulp Newsprint	Dry Debarking Closed screen room Steam condensate stripping Soap & turpentine recovery 55-60% ClO_2 substitution	Four primary clarifiers Oxygen enhanced activated sludge treatment	Kaministiquia River to Lake Superior
Domtar (Cornwall)	Bleached kraft pulp	Fine paper	Dry debarking Steam condensate stripping Spill recovery system Lime spill clarifier 45% ClO_2 substitution	Primary clarifier	St. Lawrence River
Domtar (Red Rock)	Unbleached kraft pulp Groundwood pulp	Newsprint Linerboard	Steam condensate stripping Spill clarifier system	Primary clarifier	Nipigon Bay to Lake Superior

Table 2.2 (con't.)
The Sulphate (Kraft) Category

Plant Name	Process	Product	In-Plant Control	External Treatment	Discharge
E.B. Eddy (Espanola)	Bleached kraft pulp	Market kraft pulp Specialty paper	Dry debarking Steam condensate stripping Oxygen Delignification Extended Cooking 30-60% ClO_2 substitution	2 paper mill clarifiers Woodroom settling lagoon Aerated stabilisation basin	Spanish River to Lake Huron
James River Marathon (Marathon)	Bleached kraft pulp	Market kraft pulp	Dry debarking Spill collection system New brownstock washers 100% ClO_2 substitution	Primary clarifier Foam retention lagoon	Lake Superior
Kimberly Clark (Terrace Bay)	Bleached kraft pulp	Market kraft pulp	Dry debarking Steam condensate stripping Spill recovery system ClO_2 substitution	2 primary clarifiers Aerated stabilization basin	Blackbird Creek to Lake Superior
Malette (Smooth Rock Falls)	Bleached kraft pulp	Market kraft pulp	Closed Screen Room Steam condensate stripping New Recovery Boiler Oxygen Delignification 100% ClO_2 substitution	Primary clarifier	Mattagami River to James Bay

Table 2.3
The Sulphite-Mechanical Category

Plant Name	Process	Product	External Treatment	Discharge
Abitibi-Price (Fort William)	Groundwood pulp Ultra-high yield sulphite pulp	Newsprint	Primary clarifiers Settling Pond	Lake Superior
Abitibi-Price (Iroquois Falls)	Groundwood pulp High yield sulphite	Newsprint	2 primary clarifiers	Abitibi River
Abitibi-Price (Provincial Papers)	Groundwood pulp Purchased kraft pulp	Fine paper	Woodroom clarifier Serpentine settling basin	Lake Superior
Abitibi-Price (Thunder Bay)	Groundwood pulp High yield sulphite pulp	Newsprint	Woodroom clarifier 2 settling basins	Lake Superior
Boise-Cascade (Kenora)	Groundwood pulp High yield sulphite pulp Purchased kraft pulp	Newsprint	Primary clarifier	Winnipeg River
Quebec & Ontario (Thorold)	Thermomechanical pulp Deinked pulp	Newsprint	Primary clarifier Pure oxygen activated sludge treatment	Old Welland Canal to Twelve Mile Creek
St. Marys (Sault Ste. Marie)	Groundwood pulp Purchased kraft pulp	Groundwood specialty papers	Primary clarifier	St. Marys River
Spruce Falls (Kapuskasing)	Groundwood pulp Thermomechanical pulp Low yield sulphite pulp	Newsprint	Primary clarifiers	Kapuskasing River

Table 2.4
The Corrugating Category

Plant Name	Process	Product	In-Plant Control	External Treatment	Discharge
Domtar Inc. (Trenton)	Sodium carbonate semi-chemical pulp Recycled corrugated pulp	Corrugating medium	Liquor recovery & reuse Process water recycle		Trent River to Lake Ontario
MacMillan-Bloedel (Sturgeon Falls)	Neutral semi-chemical pulp Mechanical pulp	Corrugating medium		Flotation clarifier Anaerobic treatment	Sturgeon River to Lake Nipissing

Table 2.5
The Deinking/Board/Fine Papers/Tissue Category

Plant Name	Process	Product	External Treatment	Discharge
Beaver Wood (Thorold)	Purchased recycled waste paper and board	Paperboard	Clarifier Spill pond	Beaverdam Creek to Lake Gibson
Domtar (St. Catharines)	Purchased pulp Recycled clean waste paper	Fine paper	Primary clarifier	Old Welland Canal to Twelve Mile Creek
E.B. Eddy (Ottawa)	Purchased pulp	Fine paper	Primary clarifier	Ottawa River to the St. Lawrence River
Kimberly-Clark (Huntsville)	Purchased pulp	Tissue	Primary clarifier Polishing basin 3 percolating bed filters	Spray irrigation (summer) Big East River (winter)
Kimberly-Clark (St. Catharines)	Purchased pulp	Tissue Crepe paper Fine paper	Primary clarifier 2 settling ponds	Old Welland Canal to Twelve Mile Creek
Noranda (Thorold)	Purchased pulp Recycled and deinked waste paper	Fine paper	Primary clarifier Activated sludge treatment for deinking plant effluent only	Old Welland Canal to Twelve Mile Creek
Sonoco (Trenton)	Recycled waste paper and board	Packaging material	2 flotation clarifiers	Trent River to Lake Ontario
Strathcona (Napanee)	Recycled waste paper and board	Boxboard	Flotation clarifier Settling basins Aerated stabilisation basin	Napanee River to Lake Ontario

Table 2.6
1990 Discharge Data for the Sulphate (Kraft) Category

Plant Name	Rainbow Trout	Daphnia Magna	Flow m^3/day	BOD kg/day	TSS kg/day	AOX kg/day	Flow m^3/tonne	BOD kg/tonne	TSS kg/tonne	AOX kg/tonne
Boise (Fort Frances)	10/12	2/8	80,710	9,430	10,987	1,964	83	9.72	11.33	3.43
CPFP (Dryden)	5/14	0/11	89,192	2,761	5,011	1,936	92	2.86	5.19	2.63
CPFP (Thunder Bay)	12/12	9/12	176,069	48,622	15,335	4,171	77	21.23	6.70	3.26
Domtar (Cornwall)	3/7	2/12	129,073	20,867	9,750	431	178	28.74	13.43	1.05
Domtar (Red Rock)	7/7	3/12	97,050	15,326	6,026	175	118	18.71	7.36	n/a
Eddy (Espanola)	0/7	0/12	101,641	1,808	2,592	854	108	1.92	2.75	0.91
JRM (Marathon)	12/12	12/12	60,430	11,991	2,654	2,787	142	28.21	6.24	6.56
KC (Terrace Bay)	0/12	0/12	91,695	1,452	3,866	1,967	83	1.31	3.48	1.77
Malette (Smooth Rock Falls)	10/12	12/12	51,374	8,011	1,750	1,208	172	26.88	5.87	4.05
Total	59/95	40/103	877,234	120,268	57,971	15,493				
Average							117	15.51	6.93	2.96

Note
Rainbow trout and Daphnia magna toxicity test results are reported as the number of toxic samples/total number of samples.

Table 2.7
1990 Discharge Data for the Sulphite-Mechanical Category

Plant Name	Rainbow Trout	Daphnia Magna	Flow m^3/day	BOD kg/day	TSS kg/day	Flow m^3/tonne	BOD kg/tonne	TSS kg/tonne
A-P (Fort William)	22/22	22/22	27,078	13,277	1,227	73	35.79	3.31
A-P (Iroquois Falls)	11/11	11/11	64,946	50,054	7,767	81	62.49	9.70
A-P (Provincial)	0/6	0/11	47,679	4,265	1,599	112	10.06	3.77
A-P (Thunder Bay)	12/12	12/12	46,739	28,280	1,869	99	59.92	3.96
B-C (Kenora)	12/12	11/11	51,255	33,132	3,376	55	35.66	3.63
Q&O	0/5	0/8	61,546	1,385	3,049	73	1.65	3.63
St. Marys	12/12	12/12	34,731	6,849	5,814	69	13.54	11.49
Spruce Falls	12/12	12/12	83,944	35,622	7,260	85	36.24	7.39
Total	81/92	80/99	417,918	172,864	31,961			
Average						81	31.92	5.86

Note
Rainbow trout and Daphnia magna toxicity test results are reported as the number of toxic samples/total number of samples.

Table 2.8
1990 Discharge Data for the Corrugating Category

Plant Name	Rainbow Trout	Daphnia Magna	Flow m^3/day	BOD kg/day	TSS kg/day	Flow m^3/tonne	BOD kg/tonne	TSS kg/tonne
Domtar (Trenton)	12/12	9/12	4,028	5,130	623	12	15.69	1.91
MB (Sturgeon Falls)			12,843	32,012	2,624	47	116.83	9.58
Total	12/12	9/12	16,871	37,142	3,247			
Average						30	66.26	5.75

Note
Rainbow trout and Daphnia magna toxicity test results are reported as the number of toxic samples/total number of samples.
Toxicity test data for MacMillan Bloedel were invalid due to analytical problems.

Table 2.9
1990 Discharge Data for the Deinking/Board/Fine Papers Tissue Category

Plant Name	Rainbow Trout	Daphnia Magna	Flow m^3/day	BOD kg/day	TSS kg/day	Flow m^3/tonne	BOD kg/tonne	TSS kg/tonne
Beaver Wood (Thorold)	0/12	5/12	15,114	1,920	688	67	8.53	3.06
Domtar (St. Catharines)	1/7	3/12	10,186	1,025	379	63	6.37	2.35
E. B. Eddy (Ottawa)	6/12	10/12	7,401	1,148	450	45	6.92	2.71
K-C (Huntsville)	0/5	0/6	793	3	4	8	0.03	0.04
K-C (St. Catharines)	0/8	0/12	8,755	319	66	81	2.95	0.61
Noranda (Thorold)	12/12	11/12	22,128	3,463	1,569	82	12.83	5.81
Sonoco (Trenton)	5/12	4/12	3,744	1,509	524	12	4.95	1.72
Strathcona (Napanee)	4/11	2/12	3,321	386	214	19	2.17	1.20
Total	28/79	35/90	71,442	9,773	3,894			
Average						47	5.59	2.19

Note
Rainbow trout and Daphnia magna toxicity test results are reported as the number of toxic samples/total number of samples.

2.4 REFERENCES

1. Ontario Ministry of the Environment (1992). MISA Economic Assessment: Potential Water Pollution Abatement Programs for Ontario Pulp and Paper Mills. Toronto, Ontario.

2. N. McCubbin, E. Barnes, E. Bergman, H. Edde, J. Folke, D. Owen (1992). Best Available Technology for the Ontario Pulp and Paper Industry. Report prepared for the Ontario Ministry of the Environment. Toronto, Ontario. ISBN 0-7729-9261-4

3. N. Bonsor, N. McCubbin, J.B. Sprague (1991). Kraft Mill Effluents in Ontario. Toronto, Ontario.

EFFLUENT MONITORING

CHAPTER 3

OF THE

DEVELOPMENT DOCUMENT

TABLE OF CONTENTS

LIST OF TABLES

3.1 PRE-REGULATION EFFLUENT MONITORING

Traditionally, BOD, TSS and acute lethality have been the principal parameters used to evaluate the quality of pulp and paper mill effluent discharges. However, these parameters only provide a basis for examining the short term local effects of these discharges on the environment. In order to examine long-term effects and to set adequate effluent control limits, it is necessary to establish whether persistent, bioaccumulative substances are present in the effluent.

As part of the MISA initiative, the Ontario pulp and paper industry was asked to conduct a voluntary pre-regulation effluent monitoring program in order to generate the data necessary for the development of the effluent monitoring regulation for the pulp and paper sector. Accordingly in 1987, under the auspices of the Ontario Forest Industries Association (OFIA), the Ontario pulp and paper industry conducted a comprehensive study on the composition of pulp and paper mill effluents being discharged directly to Ontario surface waters.

Four intake water and final effluent samples were collected from each mill and the samples were analyzed for a wide range of priority and conventional pollutants including the parameters on the US EPA Priority Pollutants List. Fish toxicity tests were conducted on all effluent samples and in total, one hundred and forty-four specific chemical and biological parameters were monitored. In addition, two open GC/MS "forensic scans" were also conducted at each mill in order to fully characterize mill effluent. In order to verify the data collected by industry, the Ontario Ministry of the Environment collected and analyzed one audit sample from each mill and conducted one GC/MS open characterization analysis.

Sample collection and analysis were performed according to standard protocols employing strict quality assurance/ quality control procedures. The results of the pre-regulation effluent monitoring program are documented in the report on Ontario Pulp and Paper Mills Effluent Composition[1] and in the Development Document for the Effluent Monitoring Regulation for the Pulp and Paper Sector[2].

3.2 MISA EFFLUENT MONITORING

The results of the pre-regulation effluent monitoring program were used to develop the effluent monitoring regulation for the pulp and paper sector (Ontario Regulation 435/89 as amended to Ontario Regulation 202/90). Under the effluent monitoring regulation, direct discharge mills were required to conduct one year of effluent monitoring starting on January 1, 1990. Mills were required to monitor for up to 135 parameters on a daily, thrice weekly, weekly, monthly, bi-monthly and semi-annual basis. The Development Document for the Effluent Monitoring Regulation for the Pulp and Paper Sector[2] explains the rationale behind the selection of the parameters to be monitored and the frequency of monitoring.

Mills were required to monitor process effluent, cooling water effluent, storm water effluent, emergency overflow effluent, backwash effluent and waste disposal site effluent. In addition, intake water was monitored on a voluntary basis by nine of the mills. In total, 191,932 pieces of data were collected including 46,646 pieces of quality assurance/quality control data. A summary of the effluent monitoring data is presented in Appendix II of this document along with a description of the extensive data validation exercise that was followed in order to confirm the integrity of the data.

3.3 CANDIDATE PARAMETER SELECTION

Following data collection and validation, the selection criteria identified in the Issue Resolution Committee report on Selection of Parameters for Limits were used to identify candidate parameters for effluent limits setting. A parameter was selected for effluent limits setting if the effluent monitoring data for any process effluent showed, at a 95% confidence level, that 10% or more of the data for that parameter and for that effluent, were at concentrations greater than or equal to the parameter's regulation method detection limit.

A total of 77 parameters were selected as candidate parameters for effluent limits setting for the sulphate (kraft) category, 43 for the sulphite/mechanical category, 38 for the corrugating category and 49 for the deinking/board/fine papers/tissue category. The parameter pH was not included in candidate parameter selection because it will be regulated separately under the effluent limits regulation.

3.4 QA/QC DATA ASSESSMENT

Following candidate parameter selection, quality assurance/quality control (QA/QC) data were examined in order to determine whether the effluent monitoring data for the parameters selected for effluent limits setting were of reliable quality and were acceptable for use in the development of effluent limits.

The QA/QC data assessment involved the retrieval and screening of the field QA/QC data and corresponding process effluent monitoring data for each mill. The data were sorted and summarized and evaluated according to the procedures outlined in the Issue Resolution Committee report on Quality Assurance and Quality Control[3]. A parameter was removed from further consideration in the effluent limits setting process if the QA/QC data assessment indicated that its presence in mill effluent was highly suspect or if all of the data for the parameter were of limited quality or unreliable quality.

Table 3.1 lists the parameters that were removed from further consideration in the effluent limits setting process because the QA/QC data assessment indicated that their presence in mill effluent was highly suspect. Table 3.2 lists the parameters that were removed from further consideration because all of the effluent monitoring data were or limited or unreliable quality.

Following the QA/QC data assessment, 54 parameters remained as candidate parameters for effluent limits setting for the sulphate (kraft) category, 30 for the sulphite/ mechanical category, 28 for the corrugating category and 41 for the deinking/board/fine papers/tissue category. Tables 3.3 to 3.6 present the candidate parameters selected for each mill category following QA/QC data assessment.

Full details of the QA/QC data assessment are presented in the Report on the Analysis of the Quality Assurance and Quality Control Data for the MISA Pulp and Paper Sector[4].

Table 3.1
Parameters Removed Because Presence in Effluent was Highly Suspect

Analytical Test Group	Parameter	Category K	Category M	Category C	Category D
9	Molybdenum	▒			
	Thallium	▒			
	Vanadium	▒		▒	
16	1,2-Dichloroethane	▒	▒		▒
	Bromodichloromethane		▒		
	Methylene chloride	▒	▒		▒
19	Benzo(k)fluoranthene	▒	▒		
	Benzo(g,h,i)perylene	▒	▒		
	Dibenz(a,h)anthracene	▒	▒		
20	2,3,5-Trichlorophenol	▒			
23	1,2,3,4-Tetrachlorobenzene	▒			
	1,2,3,5-Tetrachlorobenzene	▒			
	1,2,3-Trichlorobenzene	▒	▒		
	1,2,4,5-Tetrachlorobenzene	▒			
	1,2,4-Trichlorobenzene		▒		
	2,4,5-Trichlorotoluene		▒		
	Hexachlorobenzene	▒			
	Hexachlorobutadiene	▒			
	Hexachlorocyclopentadiene	▒			▒
	Hexachloroethane	▒			
	Octachlorostyrene	▒			
	Pentachlorobenzene	▒	▒		
24	Total H6CDF				▒
	Total H7CDF	▒			

Legend
K = Sulphate (Kraft)
M = Sulphite-Mechanical
C = Corrugating
D = Deinking/Board/Fine Papers/Tissue
▒ = Parameter removed from category because presence in effluent was highly suspect.

Table 3.2
Parameters Removed Due to Data of Limited or Unreliable Quality

Analytical Test Group	Parameter	Category			
		K	M	C	D
5a	DOC			▒	
8	Volatile Suspended Solids			▒	
9	Cobalt			▒	
	Lead			▒	
	Molybdenum			▒	
	Nickel			▒	
	Thallium			▒	
16	Chloromethane		▒		
17	Benzene		▒		
20	p-Cresol				▒
23	1,2,4-Trichlorobenzene	▒			▒
	2,4,5-Trichlorotoluene	▒			
24	Total H7CDD	▒			
26	Chlorodehydroabietic Acid		▒	▒	▒
	Levopimaric Acid			▒	
	Neoabietic Acid				▒

<u>Legend</u>
K = Sulphate (Kraft)
M = Sulphite-Mechanical
C = Corrugating
D = Deinking/Board/Fine Papers/Tissue
▒ = Parameter removed from category due to data of limited or unreliable quality.

Table 3.3
Candidate Parameters selected for the Sulphate (Kraft) Category following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		6	8	9	10	11	14	16	19	21
1	COD	1	1	1	1	1	.	1	1	1
4a	Ammonia plus Ammonium		1		1	1	1	1	1	1
	Total Kjeldahl Nitrogen	1	1	1	1	1	1	1	1	1
4b	Nitrate + Nitrite		1		1				1	1
5a	DOC	.	.	.	.	.	1	.	.	.
6	Total phosphorus	1	1	1	1	1	1	1	1	1
7	Specific conductance	1	1	1	1	1	1	1	1	1
8	Total suspended solids	1	1	1	1	1	1	1	1	1
	Volatile Suspended Solids	1	1	.	.	.	1	.	1	.
9	Aluminum	1	1	1	1	1	1	1	1	1
	Chromium		.	1				1	1	
	Copper	1		1	1		1	1	1	1
	Nickel						1	1	1	
	Zinc	1	1	1	1	1	1	1	1	1
12	Mercury							1		
15	Sulphide	1	1	1	1	1	1	1	1	1
16	Bromodichloromethane				1	.				
	Chloroform	1	2	1	1	1	1	2	1	1
17	Benzene				1	.	1			1
	Styrene				1	.				3
	Toluene	1			1	.	1			1
19	Acenaphthylene				1					
	Camphene	1						1		1
	Chrysene				1					
	Fluoranthene				1					
	Naphthalene				1					
	Phenanthrene				1					
	Pyrene				1					
20	2,4,6-Trichlorophenol	1		1		1	1		1	3
	2,4-Dichlorophenol	1	1	1					1	3
	Phenol			2	3	1				1
	m-Cresol									1
	o-Cresol	1			1					
	p-Cresol									1

Table 3.3 (cont'd)
Candidate Parameters selected for the Sulphate (Kraft) Category Following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		6	8	9	10	11	14	16	19	21
24	2,3,7,8 TCDD								1	
	Total TCDD							1	1	
	Total TCDF	1	1	1	1		1	1	1	3
	Total PCDD							1	1	
	Total PCDF							1	1	
	Total H6CDD								1	
	Total H6CDF							1		
	Octachlorodibenzo-p-dioxin	1		1	1	1		1	1	
	Octachlorodibenzofuran							1	1	
26	Abietic Acid	1	1	1	1	1		1	1	1
	Chlorodehydroabietic Acid	2	1	1	1			1	1	1
	Dehydroabietic Acid	1	1	1	1	1	1	1	1	1
	Dichlorodehydroabietic Acid	1	1	1	1	1		1	1	1
	Isopimaric Acid	1	3	1	1	2		1		1
	Levopimaric Acid	1	1	1	1	.		1		1
	Neoabietic Acid	1	2	1	1	1		1		1
	Oleic Acid	1	1	1	1	1		1	1	
	Pimaric Acid	1	3	1	1	1		1		1
M8	BOD, 5 day, Total Demand	1	1	1	1	1	1	1	1	1
M13	Adsorbable Organic Halide	1	1	1	1	1	1	1	1	1

NOTE

(shaded) = Parameter selected as a candidate parameter for the mill indicated.

QA/QC LEGEND

1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND

6 = Boise (Fort Frances)
8 = CP (Dryden)
9 = CP (Thunder Bay)
10 = Domtar (Cornwall)
11 = Domtar (Red Rock)
14 = E.B. Eddy (Espanola)
16 = James River
19 = Kimberly-Clark (Terrace Bay)
21 = Malette

Table 3.4
Candidate Parameters selected for the Sulphite-Mechanical Category Following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		1	2A	2B	3	4	7	23	24	25
1	COD	.	.	.	.	.	1	.	1	1
4a	Ammonia plus Ammonium			1	1			1		
	Total Kjeldahl Nitrogen	1	1	1	1	1	1	1	1	1
4b	Nitrate + Nitrite	1			1	1	1	1		
5a	DOC	1	1	1	1	1		1	.	.
6	Total phosphorus	1	1	1		1	1	1	1	1
7	Specific conductance	1	1	1	1	1	1	1	1	1
8	Total suspended solids	1	1	1	1	1	1	1	1	1
	Volatile Suspended Solids	.	.	.	.	.	.	1	.	.
9	Aluminum	1	1	1	1	1	1	1	1	1
	Copper	1	1	1			1	1	1	1
	Zinc	1	1	1	1	1	1	1	1	2
16	Chloroform	1	2	2	1	1	1	1	1	1
	Styrene				1					.
	Toluene	3	1	1	1	1		1	3	1
	o-Xylene			1	1					.
19	Camphene	1		1						
20	Phenol	1	2	2		1			1	1
	m-Cresol	1	1	1		1				
	p-Cresol		1	1		1			1	
24	Octachlorodibenzo-p-dioxin		1	1		3	1		1	1
	Octachlorodibenzofuran	1								

Table 3.4 (cont'd)
Candidate Parameters selected for the Sulphite-Mechanical Category Following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		1	2A	2B	3	4	7	23	24	25
26	Abietic Acid	1	1	1	1	1	1		1	1
	Dehydroabietic Acid	1	1	1	1	1	1	1	1	1
	Isopimaric Acid	1	1	1	1	1	1		1	1
	Levopimaric Acid	1	1	1		1	1		1	.
	Neoabietic Acid	1	1	1		1	1		1	1
	Oleic Acid	1	1	1		1	1		1	1
	Pimaric Acid	1	1	1	1	1	1		1	1
M8	BOD, 5 day, Total Demand	1	1	1	1	1	1	1	1	1

NOTE

= Parameter selected as a candidate parameter for the mill indicated.

QA/QC LEGEND

1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND

1 = AP (I. Falls)
2A = AP (Ft.W) - Control Point 0100
2B = AP (Ft.W) - Control Point 0200
3 = AP (PP)
4 = AP (Thunder Bay)
7 = Boise (Kenora)
23 = Quebec & Ontario
24 = St. Marys
25 = Spruce Falls

Table 3.5
Candidate Parameters selected for the Corrugating Category Following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number		
		13	20A	20B
1	COD	1	.	.
4a	Ammonia plus Ammonium	1	3	3
	Total Kjeldahl Nitrogen	1	3	3
4b	Nitrate + Nitrite	1	3	3
6	Total phosphorus	1	3	3
7	Specific conductance	1	3	3
8	Total suspended solids	1	3	3
9	Aluminum	1	3	3
	Cadmium	1	3	3
	Chromium	1	3	3
	Copper	1	3	3
	Zinc	1	3	3
16	Chloroform	1		
20	Phenol	1		
	o-Cresol	1		
24	Total TCDF	1		
	Total H6CDD	1		
	Total H7CDD	1		
	Total H7CDF	1		
	Octachlorodibenzo-p-dioxin	1		
	Octachlorodibenzofuran	1		

Table 3.5 (cont'd)
Candidate Parameters selected for the Corrugating Category Following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number 13	20A	20B
26	Abietic Acid	1		3
	Dehydroabietic Acid	1	3	3
	Isopimaric Acid	1	3	3
	Neoabietic Acid	1	3	
	Oleic Acid	1	3	3
	Pimaric Acid	1	3	3
M8	BOD, 5 day, Total Demand	1	3	3

NOTE
(shaded) = Parameter selected as a candidate parameter for the mill indicated.

QA/QC LEGEND
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND
13 = Domtar (Trenton)
20A = MacMillan - Control Point 1200
20B = MacMillan - Control Point 1300

Table 3.6
Candidate Parameters Selected for the Deinking/Board/Fine Papers/Tissue Category Following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number							
		5	12	15	17	18	22	26	27
1	COD	.	1	1	1	1	.	1	1
4a	Ammonia plus Ammonium			1				1	
	Total Kjeldahl Nitrogen	1	1	1	1	1	1	1	1
4b	Nitrate + Nitrite		1	1			1		
5a	DOC	1		.	.	.	1	.	.
6	Total phosphorus	1			1	1	1	1	1
7	Specific conductance	1	1	1	1	1	1	1	1
8	Total suspended solids	1	1	1		1	1	1	1
	Volatile Suspended Solids	.	.	.	.	.	1	1	.
9	Aluminum	1	1	1	1	1	1	1	1
	Chromium								1
	Copper	3	1	1	1		1		1
	Zinc	3	3	1	1	1	1	3	1
16	1,1-Dichloroethane					1			3
	1,1-Dichloroethylene	3							1
	Bromodichloromethane						1		
	Chloroform		1	1	1		2	3	1
	Dibromochloromethane						1		
	Tetrachloroethylene					1			
	Trichloroethylene					1			
17	Benzene	3	1				3		1
	Toluene	1				1		1	1
	m-Xylene and p-Xylene	3					1		
	o-Xylene	1					1		
19	2-Methylnaphthalene					1			
	Naphthalene			1		1			1
20	Pentachlorophenol								1
	Phenol	1				1		3	1
	m-Cresol							1	2

Table 3.6 (con't.)
Candidate Parameters Selected for the Deinking/Board/Fine Papers/Tissue Category Following QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number 5	12	15	17	18	22	26	27
23	1,2,3,4-Tetrachlorobenzene			1					
	1,2,3-Trichlorobenzene			1					
24	Total TCDF					1			
	Octachlorodibenzo-p-dioxin	1			3	.	1		
26	Abietic Acid	3	1	3		1			1
	Dehydroabietic Acid	1	1	1		1	1	1	1
	Isopimaric Acid	1	1			1			1
	Levopimaric Acid	3	1			1			
	Oleic Acid	3				3		3	1
	Pimaric Acid	1	1	3		1		1	3
M8	BOD, 5 day, Total Demand	1	1	1	1	1	1	1	1
M13	Adsorbable Organic Halide	.	.	.	.	.	1	.	.

NOTE

(shaded) = Parameter selected as a candidate parameter for the mill indicated.

QA/QC LEGEND

1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND

5 = Beaver Wood
12 = Domtar (St. Catharines)
15 = E.B. Eddy (Ottawa)
17 = Kimberly-Clark (Huntsville)
18 = Kimberly-Clark (St. Catharines)
22 = Noranda
26 = Strathcona
27 = Sonoco

3.5 REFERENCES

1. Ontario Forest Industries Association (1988). Ontario Pulp and Paper Mills Effluent Composition. Toronto, Ontario.

2. Ontario Ministry of the Environment (1989). The Development Document for the Effluent Monitoring Regulation for the Pulp and Paper Sector. Toronto, Ontario.

3. Ontario Ministry of Environment (1990). MISA Issues Resolution Process - Issue Resolution Committee Reports. Toronto, Ontario. June 1990.

4. Ontario Ministry of the Environment (1992). Report on the Analysis of the Quality Assurance and Quality Control Data for the MISA Pulp and Paper Sector. Toronto, Ontario.

BEST AVAILABLE TECHNOLOGY

CHAPTER 4

OF THE

DEVELOPMENT DOCUMENT

TABLE OF CONTENTS

LIST OF TABLES

4.1 BEST AVAILABLE TECHNOLOGY

In order to identify best available technology (BAT) for the Ontario pulp and paper industry, the Ontario Ministry of the Environment hired a consultant to:

- develop an inventory of available technologies for the control of pulp and paper mill effluent discharges
- develop an inventory of the current technologies used by Ontario pulp and paper mills for the control of effluent discharges
- identify the "best available" technologies and assess the technical feasibility, capital costs, operating expenditures and resulting effluent quality of applying these technologies to Ontario mills.

The BAT consultant reviewed available technologies from around the world including North America, Europe, Australia and Japan. Available technologies were evaluated in terms of their ability to reduce pollutants in the effluent from pulp and paper mills similar to those in Ontario.

In evaluating the available technologies, the BAT consultant considered:

- modifications to the production process to reduce or eliminate the formation of pollutants (ie. pollution prevention)
- chemical substitution
- in-plant control measures, including abatement of accidental spills
- best management practices (BMP)
- water conservation
- external effluent treatment technologies
- energy conservation.

From the list of available technologies, the BAT consultant selected a smaller list of demonstrated technologies. Demonstrated technologies are technologies for which data are available that can be used to predict, with a reasonable degree of confidence, the reliability of the technologies with respect to contaminant reductions and effluent variability at any plant in the sector.

The BAT consultant used the following criteria to select demonstrated technologies from the list of available technologies:

- the technology is used in the pulp and paper sector or in a similar industrial sector or sub-sector that produces effluents with similar characteristics

- the technology can be retrofitted in at least some of the existing facilities with a reasonable degree of confidence

- the technology has been in commercial use for a significant time, generally at least one year

- design/sizing and costing information is available for the technology or sufficient information is available to develop it.

New emerging totally chlorine free pulp bleaching technologies were reviewed by the BAT consultant but were not considered in the selection of demonstrated technologies as they were not sufficiently developed at the time of the study to meet the demonstrated technology selection criteria. Since the completion of the BAT study, the development and commercialization of totally chlorine free pulp bleaching technologies have progressed rapidly.

The BAT consultant grouped the demonstrated technologies together to form BAT technology trains consisting of individual process modifications and external treatment control measures designed to:

- produce non-lethal effluent to rainbow trout and <u>Daphnia magna</u>

- make effective use of recycling, re-use and reduction

- reduce AOX in the effluent from bleached kraft mills to the greatest extent possible

- conserve water and minimize water usage.

The BAT technology trains represent integrated groups of proven, demonstrated control technologies that can be used to improve effluent quality substantially. They serve as the basis for calculating the costs to reach various levels of effluent quality and pollution abatement and they are the cornerstone upon which the effluent limits are based.

The BAT technology trains have been selected to provide logical, technically sound approaches to reducing effluent discharges. They do not represent the only way of attaining the effluent quality identified nor do they represent the only technically sound way of combining demonstrated technologies.

Each BAT technology train is an independent group of effluent control technologies and in most cases it is neither intended nor reasonable for a mill to install first one train then the other.

All of the BAT technology trains include secondary effluent treatment and are based on the premise that Ontario mills can be retrofitted to discharge an effluent flow of 50 m^3/tonne of product which is the flowrate that the BAT consultant believes is achievable by all mills in Ontario. This flowrate represents a 57% reduction in the average production-based flowrate for mills in the sulphate (kraft) category and a 38% reduction for mills in the sulphite-mechanical category. The average production-based flowrates for mills in the other two categories are already below the 50 m^3/tonne level.

THE SULPHATE (KRAFT) CATEGORY

Five BAT technology trains have been identified for the sulphate (kraft) category. They consist of a combination of in-plant control measures for pollution prevention at source and external treatment technologies. Each train is briefly described below. A more detailed description can be found in the report on Best Available Technology for the Ontario Pulp and Paper Industry[1].

Technology train K1 represents the simplest way of complying with the current Ontario requirements and the new Federal requirements for pulp and paper mill effluent discharges. Train K1 involves the use of high chlorine dioxide substitution for molecular chlorine in the bleach process and biological treatment of the mill effluent. By using high chlorine dioxide substitution, 2,3,7,8-TCDD and 2,3,7,8-TCDF discharges can be reduced to below their detection level.

Technology train K2 is similar to train K1 but completely eliminates the use of molecular chlorine by using 100% chlorine dioxide substitution in the bleaching process. Train K2 represents the best attainable improvement in effluent quality by internal "reduction at source" measures without modifying the Kappa number of the pulp entering the bleach plant. The Kappa number is a measure of the lignin content in pulp. Pulps with high Kappa numbers require more bleach chemicals than pulps with low Kappa numbers to achieve the same levels of pulp brightness.

Technology train K3 is similar to train K2 but with the addition of oxygen delignification to reduce the Kappa number of the pulp entering the bleach process. Oxygen delignification systems involve the treatment of the pulp with elemental oxygen to reduce the Kappa number by up to 50% thereby reducing the amount of bleaching chemicals required.

Technology train K4 is similar to train K3 but includes extended cooking instead of oxygen delignification. Extended cooking, like oxygen delignification, is used to reduce the Kappa number of the pulp entering the bleach plant. Extended cooking involves the progressive addition of cooking liquor to the digester and the results are similar to those attainable with train K3.

Technology train K5 is a combination of extended cooking and oxygen delignification and represents the most effective effluent control attainable by demonstrated technology. Train K5 also involves the use of activated sludge effluent treatment instead of aerated stabilisation treatment. This results in greater contaminant reduction. The five technology trains for the sulphate (kraft) category are listed in Table 4.1.

Table 4.1
BAT Technology Trains for the Sulphate (Kraft) Category

Pollution Prevention and External Control Technologies	BAT Technology Trains				
	K1	K2	K3	K4	K5
Internal Spill Control	Yes	Yes	Yes	Yes	Yes
Extended Cooking				Yes	Yes
Improved Brownstock Washing	Yes	Yes	Yes	Yes	Yes
High Chlorine Dioxide Substitution	Yes				
100% Chlorine Dioxide Substitution		Yes	Yes	Yes	Yes
Oxygen Delignification			Yes		Yes
Aerated Stabilisation Basin Treatment	Yes	Yes	Yes	Yes	
Activated Sludge Treatment					Yes
Emergency Spill Containment	Yes	Yes	Yes	Yes	Yes

THE SULPHITE-MECHANICAL AND CORRUGATING CATEGORIES

The BAT technology trains identified for mills in the sulphite-mechanical and corrugating categories consist mainly of external treatment technologies as the variety of in-plant control technologies for these types of mills is quite restricted.

All of the technology train options identified for the mills in the sulphite-mechanical and corrugating categories include activated sludge treatment and two of the options include tertiary effluent treatment by either granular filtration or chemically assisted coagulation.

Technology trains S1/C1 consist of activated sludge treatment while technology trains S2/C2 and S3/C3 consist of activated sludge treatment and granular filtration to reduce suspended solid discharges. By reducing suspended solid discharges, the discharges of the pollutants that tend to associate with the solid fraction of the effluent stream will also be reduced.

Technology trains S3 and C3 consist of activated sludge treatment and chemically-aided coagulation to reduce the discharges of suspended solids, heavy metals and phosphate. Chemically aided coagulation involves the addition of a coagulant such as alum (aluminum sulphate) to biologically treated effluent prior to tertiary clarification. The three technology trains for the sulphite-mechanical and corrugating categories are listed in Table 4.2.

Table 4.2
BAT Technology Trains for the Sulphite-Mechanical and Corrugating Categories

Pollution Prevention and External Control Technologies	BAT Technology Trains		
	S1/C1	S2/C2	S3/C3
Activated Sludge Treatment	Yes	Yes	Yes
Granular Filtration		Yes	
Chemically-aided Coagulation			Yes

THE DEINKING/BOARD/FINE PAPERS/TISSUE CATEGORY

The BAT technology trains identified for mills in the deinking/board/fine papers/tissue categories consist mainly of external treatment technologies as the variety of in-plant control technologies for these types of mills is quite restricted. The opportunities for effluent flow reduction at source in these mills are generally limited to improving process water management. The alternative technology trains all include effluent flow reduction to under 50 m^3/tonne of product by in-plant process modifications and secondary treatment of mill effluent.

Technology train F1 involves the installation of aerated stabilization basin treatment while technology trains F2 to F4 consist of activated sludge effluent treatment with provision for granular filtration in technology train F3 and chemically-aided coagulation in technology train F4. The four technology trains for the deinking/board/fine papers/tissue category are listed in Table 4.3.

Table 4.3
BAT Technology Trains for the
Deinking/Board/Fine Papers/Tissue Category

Pollution Prevention and External Control Technologies	BAT Technology Trains			
	F1	F2	F3	F4
Aerated Stabilisation Basin Treatment	Yes			
Activated Sludge Treatment		Yes	Yes	Yes
Granular Filtration			Yes	
Chemically-aided Coagulation				Yes

TECHNOLOGY TRAIN COSTS AND ATTAINABLE LOADINGS

The BAT consultant estimated the capital and operating costs of applying the BAT technology trains to Ontario mills. In all cases, the costs are based on the mills as they existed in April, 1991 and are in addition to environmental protection costs incurred by the mills prior to April 1991. The cost calculations are based on the assumption that the identified BAT technology trains will produce pulps with substantially the same product quality as the current production.

Capital costs for the various BAT technology trains were calculated for each mill considering all of the site-specific information available. Capital costs were calculated for process equipment, main effluent pipelines, pump stations, roads, aeration equipment (including power supply), secondary clarifiers, sludge thickeners and reaction vessels. All cost estimates included allowances for related auxiliary equipment such as process controls. Operating costs were also calculated for each technology train and for each mill using standard base unit costs to estimate chemical costs, maintenance costs and power costs.

Capital and operating cost estimates for each mill are presented in Tables 4.4 to 4.7 along with the effluent loadings that are attainable with the implementation of each BAT technology train option. In a few cases, the costs are shown as zero because the mill effluent discharges are already below the levels considered to be attainable by the technology train concerned.

Table 4.4: Predicted Effluent Characteristics and Costs for the Sulphate (Kraft) Category

		Boise Fort Frances	CPFP Dryden	CPFP Thunder Bay	Domtar Cornwall	Domtar Red Rock	Eddy Espanola	James River Marathon	K-C Terrace Bay	Malette Smth. Rock
Base case effluent data, 1991 *(refer to notes)*										
Production rate	t/day	970	965	2,290	726	819	943	425	1,110	297
Bleached product	t/day	573	735	1,279	412	57	943	425	1,110	297
Effluent flow	m3/day	77,276	91,707	173,931	126,049	95,187	98,577	61,888	95,122	50,664
TSS	kg/day	10,793	5,524	16,000	10,415	6,260	2,745	2,578	4,279	1,512
BOD	kg/day	9,000	3,132	20,793	22,053	15,716	1,689	12,564	1,408	8,310
AOX	kg/day	1,000	2,293	2,683	401	169	841	850	1,931	596
AOX	kg/t	1.7	3.1	2.1	1.0	3.0	0.9	2.0	1.7	2.0
Phosphorus	kg/day	136	181	117	43	21	55	40	49	19
TKN	kg/day	742	175	253	355	178	325	191	441	103
Train K1	*Eliminate detectable dioxins*									
Capital Costs		$13,127,000	$12,345,000	$38,845,000	$82,764,000	$43,287,000	$15,821,000	$23,456,000	$11,938,000	$24,889,000
O & M cost	$/yr	$2,147,000	$1,560,000	$3,904,000	($3,243,000)	$168,000	$396,000	$1,336,000	$2,042,000	$1,863,000
TSS	kg/day	2,633	2,171	2,290	726	1,843	2,122	956	2,498	666
BOD	kg/day	1,170	965	1,145	363	819	943	425	1,110	296
AOX	kg/day	894	1,392	2,388	235	91	841	805	1,521	438
AOX	kg/t	1.56	1.89	1.87	0.57	1.59	0.89	1.89	1.37	1.47
Phosphorus	kg/day	47	39	40	29	33	38	17	44	12
TKN	kg/day	527	434	500	363	369	424	191	500	133
Train K2	*Eliminate molecular chlorine*									
Capital cost		$26,425,000	$18,964,000	$38,845,000	$84,462,000	$48,454,000	$35,522,000	$31,166,000	$17,281,000	$24,889,000
O & M costs	$/yr	$2,932,000	$3,047,000	$5,845,000	($2,833,000)	$530,000	$2,007,000	$2,661,000	$3,314,000	$2,199,000
TSS	kg/day	2,183	2,171	2,290	726	1,843	2,122	956	2,498	666
BOD	kg/day	970	965	1,145	363	819	943	425	1,110	296
AOX	kg/day	279	479	954	190	20	350	294	627	168
AOX	kg/t	0.49	0.65	0.75	0.46	0.35	0.37	0.69	0.56	0.56
Phosphorus	kg/day	33	39	40	29	33	38	17	44	12
TKN	kg/day	437	434	500	363	369	424	191	500	133

AOX data refers to the production rate of bleached pulp.
Effluent data for "1991" refers to calculated characteristics after projects which were physically committed before April 1991 are completed.
All effluent data shown above are long term averages.
Costs shown in parenthesis are negative.

(Table continued on next page)

Table 4.4 (cont'd.): Predicted Effluent Characteristics and Costs for the Sulphate (Kraft) Category

		Boise Fort Frances	CPFP Dryden	CPFP Thunder Bay	Domtar Cornwall	Domtar Red Rock	Eddy Espanola	James River Marathon	K-C Terrace Bay	Malette Smth. Rock
Train K3	*Eliminate molecular chlorine (including oxygen delignification)*									
Capital cost		$37,449,000	$33,789,000	$63,936,000	$93,102,000	$45,414,000	$35,522,000	$41,076,000	$45,317,000	$31,665,000
O & M costs	$/yr	$1,828,000	$1,878,000	$2,355,000	($3,471,000)	$429,000	$2,007,000	$1,872,000	$1,005,000	$1,527,000
TSS	kg/day	2,183	2,171	2,290	726	1,843	2,122	956	2,498	666
BOD	kg/day	970	965	1,145	363	819	943	425	1,110	296
AOX	kg/day	183	356	767	148	0	350	234	476	123
AOX	kg/t	0.32	0.48	0.6	0.36	0	0.37	0.55	0.43	0.41
Phosphorus	kg/day	39	39	32	29	33	38	17	44	12
TKN	kg/day	437	434	400	363	369	424	191	500	133
Train K4	*Eliminate molecular chlorine (including extended cooking)*									
Capital cost		$73,098,000	$74,744,000	$125,362,000	$116,629,000		$119,876,000	$65,255,000	$97,451,000	$52,219,000
O & M costs	$/yr	($1,877,000)	$559,000	($602,000)	($6,485,000)	(Train 4 is not	($1,947,000)	($2,208,000)	($4,833,000)	$1,316,000)
TSS	kg/day	2,183	2,171	2,290	726	applicable)	2,122	956	2,498	666
BOD	kg/day	970	965	1,145	363		943	425	1,110	296
AOX	kg/day	160	315	647	100		216	148	446	109
AOX	kg/t	0.28	0.43	0.51	0.24		0.23	0.35	0.4	0.37
Phosphorus	kg/day	39	39	28	29		38	17	44	12
TKN	kg/day	437	434	350	363		424	191	500	133
Train K5	*Eliminate molecular chlorine (including oxygen delignification and extended cooking)*									
Capital cost		$113,042,000	$119,163,000	$153,260,000	$129,433,000		$146,699,000	$85,586,000	$158,633,000	$69,025,000
O & M costs	$/yr	$3,494,000	$7,705,000	$3,691,000	($4,449,000)	(Train 5 is not	$6,896,000	$1,234,000	$1,113,000	$4,129,000
TSS	kg/day	970	965	2,290	726	applicable)	943	425	1,110	296
BOD	kg/day	485	483	1,145	363		472	213	555	148
AOX	kg/day	130	297	568	72		216	110	313	93
AOX	kg/t	0.23	0.4	0.44	0.18		0.23	0.26	0.28	0.31
Phosphorus	kg/day	39	39	28	29		38	17	44	12
TKN	kg/day	485	483	350	363		472	213	555	148

AOX data refers to the production rate of bleached pulp.
Effluent data for "1991" refers to calculated characteristics after projects which were physically committed before April 1991 are completed.
All effluent data shown above are long term averages.
Costs shown in parenthesis are negative.

Table 4.5: Predicted Effluent Characteristics and Costs for the Sulphite-Mechanical Category

		A-P Thunder Bay	A-P Fort William	A-P Prov. Paper	A-P Iroquois Falls	Boise Kenora	Q & O Thorold	St Marys Sault Ste. M.	Spruce Falls Kapuskasing
Production and effluents from MISA sampling program									
Production rate	tonnes/day	472	371	424	801	929	840	506	978
Effluent flow	m^3/day	44,728	25,658	47,206	62,414	47,786	60,740	33,337	75,806
TSS	kg/day	1,904	1,190	1,594	7,625	3,431	2,932	6,012	7,900
BOD	kg/day	27,344	14,023	4,221	55,817	34,889	1,134	5,701	31,681
Phosphorus	kg/day	9	11	4	33	14	25	25	25
Total Kjeldahl Nitrogen	kg/day	77.3	75.1	55.1	194	109.2	181.6	36.9	12.06
Train S1	*Activated sludge treatment*								
Capital cost		$31,075,000	$20,591,000	$17,144,000	$42,646,000	$32,589,000	$3,830,000	$15,550,000	$34,948,000
O & M costs	$/year	$3,934,000	$2,639,000	$1,761,000	$6,170,000	$4,614,000	$96,000	$1,957,000	$4,483,000
TSS	kg/day	472	371	424	801	929	840	506	978
BOD	kg/day	236	186	212	401	465	420	253	489
Phosphorus	kg/day	19	15	17	32	37	25	20	39
Total Kjeldahl Nitrogen	kg/day	236	186	212	401	465	181.6	253	489
Train S2	*Activated sludge treatment plus granular filter*								
Capital cost		$36,637,000	$25,240,000	$22,279,000	$50,912,000	$41,831,000	$12,397,000	$21,408,000	$44,555,000
O & M costs	$/year	$4,067,000	$2,795,000	$1,838,000	$6,497,000	$5,118,000	$462,000	$2,185,000	$4,896,000
TSS	kg/day	236	186	212	401	465	420	253	489
BOD	kg/day	165	130	148	280	325	294	177	342
Phosphorus	kg/day	9.4	7.4	8.5	16.0	18.6	16.8	10.1	19.6
Train S3	*Activated sludge treatment plus chemically assisted coagulation*								
Capital cost		$34,999,000	$23,890,000	$20,776,000	$48,412,000	$39,016,000	$9,800,000	$19,677,000	$41,622,000
O & M costs	$/year	$4,574,000	$3,194,000	$2,294,000	$7,358,000	$6,117,000	$1,365,000	$2,729,000	$5,947,000
TSS	kg/day	236	186	212	401	465	420	253	489
BOD	kg/day	165	130	148	280	325	294	177	342
Phosphorus	kg/day	9.4	7.4	8.5	16.0	18.6	16.8	10.1	19.6

All effluent data shown are long term averages.
For Quebec and Ontario Paper Company, train 1 consists of the existing UNOX system with reduced flow. The predicted effluent quality must be considered as indicative only.
TKN discharges are omitted for trains 2 and 3 due to lack of available data on performance. The values obtained will be somewhat lower than for train 1.

Table 4.6: Predicted Effluent Characteristics and Costs for the Corrugating Category

		Domtar Trenton	MacMillan Sturgeon Falls
Base Case Effluent Data *(refer to notes)*			
Production rate	tonnes/day	327	274
Effluent flow	m^3/day	4,015	13,698
TSS	kg/day	574	2,633
BOD	kg/day	5,258	19,655
Phosphorus	kg/day	3	28
Total Kjeldahl Nitrogen	kg/day	24	328
Train C1 *Activated sludge system*			
Capital cost		$10,475,000	$16,850,000
O & M costs	$/year	$2,056,000	$2,614,000
TSS	kg/day	88	274
BOD	kg/day	44	137
Phosphorus	kg/day	4	11
Total Kjeldahl Nitrogen	kg/day	44	137
Train C2 *Activated sludge system plus granular filter*			
Capital cost		$12,091,000	$20,565,000
O & M costs	$/year	$2,104,000	$2,765,000
TSS	kg/day	44	137
BOD	kg/day	31	96
Phosphorus	kg/day	1.8	5.5
Train S3 *Activated sludge system plus chemically assisted coagulation*			
Capital cost		$11,665,000	$19,505,000
O & M costs	$/year	$2,198,000	$3,059,000
TSS	kg/day	44	137
BOD	kg/day	31	96
Phosphorus	kg/day	1.8	5.5

Base case effluent data were estimated by the authors to reflect all projects to improve effluent which were physically committed before April 1991.

Table 4.7: Predicted Effluent Characteristics and Costs for the Deinking/Board/Fine Papers/Tissue Category

		Beaver Thorold	Domtar St. Catharines	Eddy Ottawa	Noranda Thorold	K-C St. Catharines	K-C Huntsville	Sonoco Trenton	Strathcona **Napanee**
Production and effluents from **MISA 1990** sampling program									
Production rate	tonnes/day	225	161	166	270	108	100	305	178
Effluent flow	m^3/day	15,121	10,473	7,599	20,775	7,736	878	3,659	3,869
TSS	kg/day	759	423	560	1,000	59	5	514	243
BOD	kg/day	1,753	1,193	1,176	3,236	324	3	1,517	608
Phosphorus	kg/day	0.9	0.2	0.3	2.0	1.0	0.3	1	1.6
Total Kjeldahl Nitrogen	kg/day	33.2	19.5	30.9	31	19.5	5.8	13.7	39.3
Train F1 *(refer to note)*		**ASB**	**AST**	**AST**	**AST**	**None**	**ASB (exists)**	**ASB**	**ASB (exists)**
Capital cost		**$3,395,000**	**$6,489,000**	**$6,775,000**	**$10,652,000**	**$0**	**$0**	**$3,099,000**	**$500,000**
O & M costs	**$/year**	**$335,000**	**$978,000**	**$979,000**	**$1,296,000**	**$0**	**$0**	**$330,000**	**$53,000**
TSS	**kg/day**	**506**	**161**	**176**	**270**	**59**	**5**	**192**	**203**
BOD	**kg/day**	**225**	**81**	**88**	**135**	**169**	**3**	**85**	**90**
Phosphorus	**kg/day**	**9**	**6.4**	**7.1**	**10.8**	**1.0**	**0.3**	**3.4**	**1.6**
Total Kjeldahl Nitrogen	**kg/day**	**101**	**81**	**88**	**135**	**19.5**	**5.8**	**38**	**41**

All effluent data shown above are long term averages.
Train 1 uses the aerated stabilisation basins where space is available on the mill site. Otherwise activated sludge treatment is used.
For trains 2, 3 and 4, the process is uniform for all mills, unless no installation at all is required, so the process is not specified in each column.
K-C St. Catharines mill effluent BOD was reduced as indicated after the 1990 MISA monitoring program by measures initiated by the company.
TKN discharges are omitted for trains 3 and 4 due to lack of available data on performance. The values obtained will be somewhat lower than for train 2.

(Table continued on next page)

Table 4.7 (cont'd.): Predicted Effluent Characteristics and Costs for the Deinking/Board/Fine Papers/Tissue Category

			Beaver Thorold	Domtar St. Catharines	Eddy Ottawa	Noranda Thorold	K-C St. Catharines	K-C Huntsville	Sonoco Trenton	Strathcona Napanee
Train F2	*Activated sludge treatment*									
Capital cost			$7,387,000	$6,489,000	$6,775,000	$10,652,000	$0	$0	$6,591,000	$4,703,000
O & M costs		$/year	$1,036,000	$978,000	$979,000	$1,296,000	$0	$0	$1,007,000	$970,000
TSS		kg/day	225	161	176	270	59	5	85	47
BOD		kg/day	113	81	88	135	169	3	43	23
Phosphorus		kg/day	9	6.4	7.1	10.8	1.0	0.3	3.4	1.9
Total Kjeldahl Nitrogen		kg/day	113	81	88	135	19.5	5.8	43	23
Train F3	*Activated sludge treatment plus granular filter*									
Capital cost			$10,559,000	$9,002,000	$9,462,000	$14,327,000	$0	$0	$8,176,000	$5,735,000
O & M costs		$/year	$1,160,000	$1,067,000	$1,076,000	$1,445,000	$0	$0	$1,054,000	$996,000
TSS		kg/day	113	81	88	135	59	5	43	23
BOD		kg/day	79	56	62	94	169	3	30	16
Phosphorus		kg/day	4.5	3.2	3.5	5.4	1.0	0.3	1.7	0.9
Train F4	*Activated sludge treatment plus chemically assisted coagulation*									
Capital cost			$9,694,000	$8,310,000	$8,717,000	$13,279,000	$0	$0	$7,760,000	$5,477,000
O & M costs		$/year	$1,402,000	$1,240,000	$1,266,000	$1,735,000	$0	$0	$1,146,000	$1,046,000
TSS		kg/day	113	81	88	135	59	5	43	23
BOD		kg/day	79	56	62	94	169	3	30	16
Phosphorus		kg/day	4.5	3.2	3.5	5.4	1.0	0.3	1.7	0.9

All effluent data shown above are long term averages.
Train 1 uses the aerated stabilisation basins where space is available on the mill site. Otherwise activated sludge treatment is used.
For trains 2, 3 and 4, the process is uniform for all mills, unless no installation at all is required, so the process is not specified in each column.
K-C St. Catharines mill effluent BOD was reduced as indicated after the 1990 MISA monitoring program by measures initiated by the company.
TKN discharges are omitted for trains 3 and 4 due to lack of available data on performance. The values obtained will be somewhat lower than for train 2.

4.2 ECONOMIC ASSESSMENT

In order to develop effluent limits based on the identified BAT technology trains, the Ministry conducted an economic assessment of the costs of imposing representative BAT technology trains on the pulp and paper sector. The objectives of the economic assessment were to:

- evaluate the cost-effectiveness of potential wastewater treatment and abatement options

- show the incremental costs of successively higher levels of contaminant removal (ie. lower levels of pollutant loadings in wastewaters)

- assess the potential financial and economic consequences of the costs associated with potential abatement program options that are cost-effective plus other MISA related costs that may be incurred by the regulated plants

- analyze the ability of industry to pass-on potential regulatory induced cost increases as product price increases or factor input price decreases.

- determine the effects of the potential regulatory-induced costs on the competitive position of Ontario pulp and paper mills.

Full details of the economic impact assessment are presented in the Ministry report titled MISA Economic Assessment: Potential Water Pollution Abatement Programs for Ontario Pulp and Paper Mills[2].

As part of the economic assessment, the estimated costs of the BAT technology trains and the contaminant removals associated with each train were used to derive abatement cost functions which showed the costs of applying different technology trains associated with successively higher levels of contaminant removal. Based on predefined decision rules, two aggregate levels of abatement and associated costs were defined for each mill category and for the sector as a whole. The costs associated with these levels of abatement were used in the subsequent financial analyses.

The first of these aggregate abatement scenarios represented the least cost Maximum Technically Achievable (MAX) level of abatement for the sector and consisted of:

- technology train K5 for sulphate (kraft) mills
- technology train S2 for sulphite-mechanical mills
- technology train C2 for corrugating mills
- technology train F2 for deinking/board/fine papers/ tissue mills.

Implementation of these technology trains could cost the pulp and paper sector $1.3 billion in capital costs and $61 million in annual operating costs. Over a ten year period these costs could represent an annualized after-tax expenditure of $181 million per year.

The second aggregate abatement scenario represented the Most Cost Effective (MCE) level of abatement. Cost effectiveness analysis is a comparative tool used to compare different technical options in order to achieve an objective at lowest cost. The objective in this analysis was the lowest cost per tonne of pollutant removed. Using the average cost per unit of pollutant removed and the average incremental cost for each incremental unit of pollutant removed as measures of cost effectiveness, the Most Cost Effective (MCE) combination of technology trains for the pulp and paper sector was determined to be:

- technology train K2 for sulphate (kraft) mills
- technology train S1 for sulphite-mechanical mills
- technology train C1 for corrugating mills
- technology train F1 for deinking/board/fine papers/ tissue mills.

Implementation of these technology trains could cost the pulp and paper sector as much as $583 million in capital costs and $54 million in annual operating costs. Over a ten year period these costs could represent an annualized after-tax expenditure of $94 million per year.

In order to assess the potential financial and economic consequences of the costs associated with the implementation of the Maximum Technically Achievable and Most Cost Effective levels of abatement, financial impact analyses were undertaken on six pulp and paper companies which operate 14 mills in Ontario and for which published financial data were available for the years 1981-1990.

For these firms, historical financial data were adjusted to determine how fifteen financial indicators would change if the costs associated with the MAX and MCE levels of abatement plus the costs associated with MISA effluent monitoring had been incurred by each firm during the relevant time period. The financial assessments indicated that if financial performance during the next decade mirrors that of the average performance over the last decade, changes in the measures of liquidity, solvency or profitability would range from little or no change for some indicators at one firm to a 27% reduction in profit at another firm for the Maximum Removal Level costs.

However, should poor financial performance similar to the early 1990's continue for the next several years, the imposition of either level of abatement would exacerbate poor financial results with the MAX option causing as much as a seven fold increase in losses for one firm. The MAX removal option could cause a reduction in cashflow and, assuming debt financing, add pressure on the firms' currently strained ability to borrow funds.

The results of the financial analyses indicated that the Most Cost Effective option would do much less to exacerbate current poor financial results among the firms analyzed than would the maximum removal option. Changes in performance indicators could range from a 0.1% reduction in the return on assets for one firm to a doubling of the net loss (from $40 million to $80 million) sustained in 1990 for another firm.

Based on a review of the technical information and the economic assessment, the Ministry concluded that technology trains K2, S1, C1 and F1 represented the preferred option for the pulp and paper sector.

4.3 REFERENCES

1. N. McCubbin, E. Barnes, E. Bergman, H. Edde, J. Folke, D. Owen (1992). Best Available Technology for the Ontario Pulp and Paper Industry. Report prepared for the Ontario Ministry of the Environment. Toronto, Ontario. ISBN 0-7729-9261-4

2. Ontario Ministry of the Environment (1992). MISA Economic Assessment: Potential Water Pollution Abatement Programs for Ontario Pulp and Paper Mills. Toronto, Ontario.

EFFLUENT LIMITS

CHAPTER 5

OF THE

DEVELOPMENT DOCUMENT

TABLE OF CONTENTS

LIST OF TABLES

5.1 SELECTION OF LIMITED PARAMETERS

Following the identification of the preferred BAT technology train option for the pulp and paper sector, the candidate parameters selected for effluent limits setting were further evaluated in order to determine those parameters for which technically defendable effluent limits could be developed. Parameters were removed from further consideration if they could not be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

The assessment of each candidate parameter is presented in this section. To indicate the prevalence of each parameter in sector effluent, the number of mills for which the candidate parameter was selected is provided along with the range of concentrations found in process effluents with data of acceptable quality. A comparison of the concentration range to the parameter's regulation method detection limit (RMDL) is also given to provide some perspective on the levels discharged.

ATG 1: Chemical Oxygen Demand (COD)

Chemical oxygen demand was selected as a candidate parameter at eighteen mills. The average COD concentration in process effluent ranged from 80 mg/L to 2,978 mg/L (8 to 298 times the RMDL of 10 mg/L). COD was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 4a: Ammonia plus Ammonium

Ammonia plus ammonium were selected as candidate parameters at fourteen mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average ammonia plus ammonium concentration in process effluent ranged from 0.2 mg/L to 2.5 mg/L (0.8 to 10.0 times the RMDL of 0.25 mg/L). Ammonia plus ammonium were removed from further consideration in the effluent limits setting process because they cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 4a: Total Kjeldahl Nitrogen (TKN)

Total Kjeldahl nitrogen was selected as a candidate parameter at all of the mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average TKN concentration in process effluent ranged from 1.1 mg/L to 11.5 mg/L (2.2 to 23.0 times the RMDL of 0.50 mg/L). TKN was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 4b: Nitrate and Nitrite

Nitrate and nitrite were selected as candidate parameters at fourteen mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average nitrate and nitrite concentration in process effluent ranged from 0.2 mg/L to 8.9 mg/L (0.8 to 35.4 times the RMDL of 0.25 mg/L). Nitrate and nitrite were removed from further consideration in the effluent limits setting process because they cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 5a: Dissolved Organic Carbon (DOC)

Dissolved organic carbon was selected as a candidate parameter at nine mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average DOC concentration in process effluent ranged from 29.3 mg/L to 739 mg/L (58.6 to 1,477 times the RMDL of 0.50 mg/L). DOC was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 6: Total Phosphorus

Total phosphorus was selected as a candidate parameter at twenty-four mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average total phosphorus concentration in process effluent ranged from 0.8 mg/L to 1.8 mg/L (8 to 18.2 times the RMDL of 0.10 mg/L). Total phosphorus discharges can be controlled to predictable, quantifiable levels with the identified BAT treatment technologies, therefore, effluent limits have been developed for this parameter.

ATG 7: Specific Conductance

Specific conductance was selected as a candidate parameter at all of the mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average specific conductance level in process effluent ranged from 283.7 μS/cm to 2,159 μS/cm (56.7 to 432 times the RMDL of 5 μS/cm). Specific conductance was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 8: Total Suspended Solids (TSS)

Total suspended solids was selected as a candidate parameter at twenty-six mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average TSS concentration in process effluent ranged from 7.5 mg/L to 168 mg/L (1.5 to 33.6 times the RMDL of 5 mg/L). Total suspended solids discharges can be controlled to predictable, quantifiable levels with the identified BAT treatment technologies, therefore, effluent limits have been developed for this parameter.

ATG 8: Volatile Suspended Solids (VSS)

Volatile suspended solids was selected as a candidate parameter at eight mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average VSS concentration in process effluent ranged from 16.5 mg/L to 127 mg/L (1.7 to 12.7 times the RMDL of 10 mg/L). VSS was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 9: Aluminum

Aluminum was selected as a candidate parameter at all of the mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average aluminum concentration in process effluent ranged from 49.1 μg/L to 6,104.3 μg/L (1.6 to 203.5 times the RMDL of 30 μg/L). Aluminum was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 9: Cadmium

Cadmium was selected as a candidate parameter at Domtar (Trenton) and MacMillan-Bloedel; however, the data from MacMillan-Bloedel are unacceptable for effluent limits setting. The average cadmium concentration in the process effluent from Domtar (Trenton) was 3.5 µg/L (1.75 times the RMDL of 2 µg/L). Cadmium was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 9: Chromium

Chromium was selected as a candidate parameter at six mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average chromium concentration in process effluent ranged from 18.0 µg/L to 148.3 µg/L (0.6 to 4.9 times the RMDL of 30 µg/L). Chromium was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 9: Copper

Copper was selected as a candidate parameter at twenty-one mills; however, the data from two of the mills, MacMillan-Bloedel and Beaver Wood, are unacceptable for effluent limits setting. The average copper concentration in process effluent ranged from 8.3 µg/L to 51.9 µg/L (0.8 to 5.2 times the RMDL of 10 µg/L). Copper was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 9: Nickel

Nickel was selected as a candidate parameter at four mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average nickel concentration in process effluent ranged from 13.3 µg/L to 31.4 µg/L (0.67 to 1.6 times the RMDL of 20 µg/L). Nickel was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 9: Zinc

Zinc was selected as a candidate parameter at all of the mills; however, the data from five of the mills, MacMillan-Bloedel, Beaver Wood, Domtar (St. Catharines), Strathcona and Spruce Falls are unacceptable for effluent limits setting. The average zinc concentration in process effluent ranged from 15.7 μg/L to 815.3 μg/L (1.6 to 81.5 times the RMDL of 10 μg/L). Zinc was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 12: Mercury

Mercury was selected as a candidate parameter at James River-Marathon. The average mercury concentration in process effluent was 0.49 μg/L (4.9 times the RMDL of 0.1 μg/L). Mercury was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 15: Sulphide

Sulphide was selected as a candidate parameter at nine mills. The average sulphide concentration in process effluent ranged from 0.1 mg/L to 1.8 mg/L (5 to 90 times the RMDL of 0.02 mg/L). Sulphide was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 16: 1,1-Dichloroethane

1,1-Dichloroethane was selected as a candidate parameter at Sonoco and Kimberly-Clark (St. Catharines); however, the data from Sonoco are unacceptable for effluent limits setting. The average 1,1-dichloroethane concentration in the process effluent from Kimberly-Clark (St. Catharines) was 0.9 μg/L (1.1 times the RMDL of 0.8 μg/L). 1,1-Dichloroethane was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 16: 1,1-Dichloroethylene

1,1-Dichloroethylene was selected as a candidate parameter at Beaver Wood and Sonoco; however, the data from Beaver Wood are unacceptable for effluent limits setting. The average 1,1-dichloroethylene concentration in the process effluent from Sonoco was 12.9 µg/L (4.6 times the RMDL of 2.8 µg/L). 1,1-Dichloroethylene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 16: Bromodichloromethane

Bromodichloromethane was selected as a candidate parameter at Domtar (Cornwall) and Noranda Forest. The average bromodichloromethane concentration in process effluent ranged from 2.8 µg/L to 6.0 µg/L (3.5 to 7.5 times the RMDL of 0.8 µg/L). Bromodichloromethane was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 16: Chloroform

Chloroform was selected as a candidate parameter at twenty-four mills; however, the data from five of the mills, Canadian Pacific (Dryden), James River-Marathon, Abitibi-Price (Ft William), Noranda Forest and Strathcona are unacceptable for effluent limits setting. The average chloroform concentration in process effluent ranged from 1.1 µg/L to 1,521 µg/L (1.6 and 2,173 times the RMDL of 0.70 µg/L). Chloroform discharges can be controlled to predictable, quantifiable levels with the identified BAT treatment technologies, therefore, effluent limits have been developed for this parameter.

ATG 16: Dibromochloromethane

Dibromochloromethane was selected as a candidate parameter at Noranda Forest. The average dibromochloromethane concentration in process effluent was 1.3 µg/L (1.2 times the RMDL of 1.1 µg/L). Dibromochloromethane was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 16: Tetrachloroethylene

Tetrachloroethylene was selected as a candidate parameter at Kimberly-Clark (St. Catharines). The average tetrachloroethylene concentration in process effluent was 1.6 µg/L (1.5 times the RMDL of 1.1 µg/L). Tetrachloroethylene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 16: Trichloroethylene

Trichloroethylene was selected as a candidate parameter at Kimberly-Clark (St. Catharines). The average trichloroethylene concentration in process effluent was 5.4 µg/L (2.8 times the RMDL of 1.9 µg/L). Trichloroethylene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 17: Benzene

Benzene was selected as a candidate parameter at eleven mills; however, the data from six of the mills, Abitibi-Price (Iroquois Falls Division), Abitibi-Price (Provincial Papers Division), Abitibi-Price (Thunder Bay Division), Beaver Wood, Noranda Forest and St. Marys Paper are unacceptable for effluent limits setting. The average benzene concentration in process effluent ranged from 0.9 µg/L to 10.5 µg/L (1.8 to 21.0 times the RMDL of 0.5 µg/L). Benzene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 17: Styrene

Styrene was selected as a candidate parameter at Domtar (Cornwall), Malette and Abitibi-Price (Provincial Papers Division); however, the data from Malette are unacceptable for effluent limits setting. The average styrene concentration in process effluent ranged from 1.3 µg/L to 4.1 µg/L (2.6 to 8.2 times the RMDL of 0.5 µg/L). Styrene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 17: Toluene

Toluene was selected as a candidate parameter at fifteen mills; however, the data from two of the mills, Abitibi-Price (Iroquois Falls) and St. Marys Paper, are unacceptable for effluent limits setting. The average toluene concentration in process effluent ranged from 0.5 µg/L to 26.3 µg/L (1.0 to 52.6 times the RMDL of 0.50 µg/L). Toluene discharges can be controlled to predictable, quantifiable levels with the defined BAT treatment technologies, therefore, effluent limits have been developed for this parameter.

ATG 17: m-Xylene and p-Xylene

m-Xylene and p-xylene were selected as candidate parameters at Beaver Wood and Noranda Forest; however, the data from Beaver Wood are unacceptable for effluent limits setting. The average m-xylene and p-xylene concentration in the process effluent from Noranda Forest was 1.8 µg/L (1.6 times the RMDL of 1.1 µg/L). m-Xylene and p-xylene were removed from further consideration in the effluent limits setting process because they cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 17: o-Xylene

o-Xylene was selected as a candidate parameter at Beaver Wood, Noranda Forest, Abitibi-Price (Provincial Papers Division) and Abitibi-Price (Fort William Division - 0200). The average o-xylene concentration in process effluent ranged from 0.43 µg/L to 2.2 µg/L (0.9 and 4.4 times the RMDL of 0.5 µg/L). o-Xylene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: 2-Methylnaphthalene

2-Methylnaphthalene was selected as a candidate parameter at Kimberly-Clark (St. Catharines). The average 2-methylnaphthalene concentration in process effluent was 3.7 µg/L (1.7 times the RMDL of 2.2 µg/L). 2-Methylnaphthalene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: Acenaphthylene

Acenaphthylene was selected as a candidate parameter at Domtar (Cornwall). The average acenaphthylene concentration in process effluent was 4.5 μg/L (3.2 times the RMDL of 1.4 μg/L). Acenaphthylene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: Camphene

Camphene was selected as a candidate parameter at five mills. The average camphene concentration in process effluent ranged from 2.4 μg/L to 15.1 μg/L (0.7 to 4.3 times the RMDL of 3.5 μg/L). Camphene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: Chrysene

Chrysene was selected as a candidate parameter at Domtar (Cornwall). The average chrysene concentration in process effluent was 1.45 μg/L (4.8 times the RMDL of 0.3 μg/L). Chrysene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: Fluoranthene

Fluoranthene was selected as a candidate parameter at Domtar (Cornwall). The average fluoranthene concentration in process effluent was 5.0 μg/L (12.5 times the RMDL of 0.4 μg/L). Fluoranthene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: Naphthalene

Naphthalene was selected as a candidate parameter at four mills. The average naphthalene concentration in process effluent ranged from 1.1 μg/L to 7.8 μg/L (0.7 to 4.9 times the RMDL of 1.6 μg/L). Naphthalene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: Phenanthrene

Phenanthrene was selected as a candidate parameter at Domtar (Cornwall). The average phenanthrene concentration in process effluent was 11.8 μg/L (29.5 times the RMDL of 0.4 μg/L). Phenanthrene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 19: Pyrene

Pyrene was selected as a candidate parameter at Domtar (Cornwall). The average pyrene concentration in process effluent was 3.0 μg/L (7.5 times the RMDL of 0.4 μg/L). Pyrene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 20: 2,4,6-Trichlorophenol

2,4,6-Trichlorophenol was selected as a candidate parameter at six mills; however, the data from one of the mills, Malette, are unacceptable for effluent limits setting. The average 2,4,6-trichlorophenol concentration in process effluent ranged from 2.8 μg/L to 6.9 μg/L (2.2 to 5.3 times the RMDL of 1.3 μg/L). 2,4,6-Trichlorophenol was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 20: 2,4-Dichlorophenol

2,4-Dichlorophenol was selected as a candidate parameter at five mills; however, the data from one of the mills, Malette, are unacceptable for effluent limits setting. The average 2,4-dichlorophenol concentration in process effluent ranged from 2.4 μg/L to 3.9 μg/L (1.4 to 2.3 times the RMDL of 1.7 μg/L). 2,4-Dichlorophenol was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 20: Pentachlorophenol

Pentachlorophenol was selected as a candidate parameter at Sonoco. The average pentachlorophenol concentration in process effluent was 0.9 µg/L (0.7 times the RMDL of 1.3 µg/L). Pentachlorophenol was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 20: Phenol

Phenol was selected as a candidate parameter at fourteen mills; however, the data from four of the mills, Canadian Pacific (Thunder Bay), Abitibi-Price (Fort William Division - 0100 and 0200), Domtar (Cornwall) and Strathcona are unacceptable for effluent limits setting. The average phenol concentration in process effluent ranged from 2 µg/L to 643 µg/L (0.8 to 268 times the RMDL of 2.40 µg/L). Because phenol discharges can be controlled to predictable, quantifiable levels with the identified BAT treatment technologies, effluent limits have developed for this parameter.

ATG 20: m-Cresol

m-Cresol was selected as a candidate parameter at six mills; however the data from one of the mills, Sonoco, are unacceptable for effluent limits setting. The average m-Cresol concentration in process effluent ranged from 2.8 µg/L to 23.8 µg/L (0.8 to 7.0 times the RMDL of 3.4 µg/L). m-Cresol was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 20: o-Cresol

o-Cresol was selected as a candidate parameter at Boise Cascade (Fort Frances), Domtar (Cornwall) and Domtar (Trenton). The average o-Cresol concentration in process effluent ranged from 4.9 µg/L to 10.0 µg/L (1.3 to 2.7 times the RMDL of 3.7 µg/L). o-Cresol was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 20: p-Cresol

p-Cresol was selected as a candidate parameter at five mills; however, the data from one of the mills, Strathcona, are unacceptable for effluent limits setting. The average p-Cresol concentration in process effluent ranged from 2.8 μg/L to 85.5 μg/L (0.8 to 24.4 times the RMDL of 3.5 μg/L). p-Cresol was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 23: 1,2,3,4-Tetrachlorobenzene

1,2,3,4-Tetrachlorobenzene was selected as a candidate parameter at E.B. Eddy (Ottawa). The average 1,2,3,4-tetrachlorobenzene concentration in process effluent was 0.01 μg/L which is equal to the RMDL. 1,2,3,4-Tetrachlorobenzene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 23: 1,2,3-Trichlorobenzene

1,2,3-Trichlorobenzene was selected as a candidate parameter at E.B. Eddy (Ottawa). The average 1,2,3-trichlorobenzene concentration in process effluent was 0.01 μg/L which is equal to the RMDL. 1,2,3-Trichlorobenzene was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)

2,3,7,8-TCDD was selected as a candidate parameter at Kimberly-Clark (Terrace Bay). The average 2,3,7,8-TCDD concentration in process effluent was 0.03 ng/L (1.5 times the RMDL of 0.02 ng/L). 2,3,7,8-TCDD discharges can be controlled to predictable, quantifiable levels with the identified BAT treatment technologies, therefore, effluent limits have been developed for this parameter.

ATG 24: Total Tetrachlorodibenzo-p-dioxin (TCDD)

Total TCDD was selected as a candidate parameter at James River-Marathon and Kimberly-Clark (Terrace Bay). The average total TCDD concentration in process effluent ranged from 0.04 ng/L to 0.32 ng/L (2 to 16 times the RMDL of 0.02 ng/L). Total TCDD was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Total Tetrachlorodibenzofuran (TCDF)

Total TCDF was selected as a candidate parameter at ten mills; however, the data from one of the mills, Malette, are unacceptable for effluent limits setting. The average total TCDF concentration in process effluent ranged from 0.02 ng/L to 0.32 ng/L (1.3 to 21.3 times the RMDL of 0.015 ng/L). Total TCDF was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Total Pentachlorodibenzo-p-dioxin (PCDD)

Total PCDD was selected as a candidate parameter at James River-Marathon and Kimberly-Clark (Terrace Bay). The average total PCDD concentration in process effluent ranged from 0.03 ng/L to 0.04 ng/L (1.5 to 2 times the RMDL of 0.02 ng/L). Total PCDD was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Total Pentachlorodibenzofuran (PCDF)

Total PCDF was selected as a candidate parameter at James River-Marathon and Kimberly-Clark (Terrace Bay). The average total PCDF concentration in process effluent ranged from 0.17 ng/L to 0.04 ng/L (11.3 to 2.7 times the RMDL of 0.015 ng/L). Total PCDF was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Total Hexachlorodibenzo-p-dioxin (H6CDD)

Total H6CDD was selected as a candidate parameter at Kimberly-Clark (Terrace Bay) and Domtar (Trenton). The average total H6CDD concentration in process effluent ranged from 0.05 ng/L to 0.30 ng/L (1.7 to 10 times the RMDL of 0.03 ng/L). Total H6CDD was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Total Hexachlorodibenzofuran (H6CDF)

Total H6CDF was selected as a candidate parameter at James River-Marathon. The average total H6CDF concentration in process effluent was 0.05 ng/L (2.5 times the RMDL of 0.02 ng/L). Total H6CDF was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Total Heptachlorodibenzo-p-dioxin (H7CDD)

Total H7CDD was selected as a candidate parameter at James River-Marathon and Domtar (Trenton); however, the data from James River Marathon are unacceptable for effluent limits setting. The average total H7CDD concentration in the process effluent from Domtar (Trenton) was 1.1 ng/L (36.7 times the RMDL of 0.03 ng/L). Total H7CDD was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Total Heptachlorodibenzofuran (H7CDF)

Total H7CDF was selected as a candidate parameter at Domtar (Trenton). The average total H7CDF concentration in process effluent was 0.32 ng/L (10.7 times the RMDL of 0.03 ng/L). Total H7CDF was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Octachlorodibenzo-p-dioxin

Octachlorodibenzo-p-dioxin was selected as a candidate parameter at fifteen mills; however, the data from two of the mills, Abitibi-Price (Thunder Bay Division) and Kimberly-Clark (Huntsville) are unacceptable for effluent limits setting. The average octachlorodibenzo-p-dioxin concentration in process effluent ranged from 0.03 ng/L to 10.9 ng/L (1 to 363 times the RMDL of 0.03 ng/L). Octachlorodibenzo-p-dioxin was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 24: Octachlorodibenzofuran

Octachlorodibenzofuran was selected as a candidate parameter at James River-Marathon, Kimberly-Clark (Terrace Bay), Abitibi-Price (Iroquois Falls Division) and Domtar (Trenton). The average octachlorodibenzofuran concentration in process effluent ranged from 0.05 ng/L to 0.8 ng/L (1.7 to 26.7 times the RMDL of 0.03 ng/L). Octachlorodibenzofuran was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Abietic Acid

Abietic acid was selected as a candidate parameter at twenty-two mills; however, the data from three of the mills, MacMillan-Bloedel (control point 1300), Beaver Wood and E.B. Eddy (Ottawa), are unacceptable for effluent limits setting. The average abietic acid concentration in process effluent ranged from 0.02 mg/L to 4.2 mg/L (4 to 840 times the RMDL of 0.005 mg/L). Abietic acid was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Chlorodehydroabietic Acid

Chlorodehydroabietic acid was selected as a candidate parameter at thirteen mills; however, the data from seven of the mills are unacceptable for effluent limits setting. The average chlorodehydroabietic acid concentration in process effluent ranged from 0.01 mg/L to 0.31 mg/L (2 to 62 times the RMDL of 0.005 mg/L). Chlorodehydroabietic acid was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Dehydroabietic Acid

Dehydroabietic acid was selected as a candidate parameter at twenty-six mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average dehydroabietic acid concentration in process effluent ranged from 0.01 mg/L to 6.6 mg/L (2 to 1320 times the RMDL of 0.005 mg/L). Dehydroabietic acid was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Dichlorodehydroabietic Acid

Dichlorodehydroabietic acid was selected as a candidate parameter at eight mills. The average dichlorodehydroabietic acid concentration in process effluent ranged from 0.01 mg/L to 0.14 mg/L (2 to 28 times the RMDL of 0.005 mg/L). Dichlorodehydroabietic was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Isopimaric Acid

Isopimaric acid was selected as a candidate parameter at twenty mills; however, the data from three of the mills, Canadian Pacific (Dryden), Domtar (Red Rock) and MacMillan-Bloedel, are unacceptable for effluent limits setting. The average isopimaric acid concentration in process effluent ranged from 0.01 mg/L to 5.0 mg/L (2 to 1000 times the RMDL of 0.005 mg/L). Isopimaric was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Levopimaric Acid

Levopimaric acid was selected as a candidate parameter at fifteen mills; however, the data from two of the mills, MacMillan-Bloedel and Beaver Wood, are unacceptable for effluent limits setting. The average levopimaric acid concentration in process effluent ranged from 0.01 mg/L to 1.7 mg/L (2 to 340 times the RMDL of 0.005 mg/L). Levopimaric acid was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Neoabietic Acid

Neoabietic acid was selected as a candidate parameter at sixteen mills; however, the data from three of the mills, Canadian Pacific (Dryden), Beaver Wood and MacMillan-Bloedel (control point 1200), are unacceptable for effluent limits setting. The average neoabietic acid concentration in process effluent ranged from 0.01 mg/L to 1.6 mg/L (2 to 320 times the RMDL of 0.005 mg/L). Neoabietic acid was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Oleic Acid

Oleic acid was selected as a candidate parameter at nineteen mills; however, the data from four of the mills, MacMillan-Bloedel, Beaver Wood, Kimberly-Clark (St. Catharines) and Strathcona are unacceptable for effluent limits setting. The average oleic acid concentration in process effluent ranged from 0.01 mg/L to 1.0 mg/L (2 to 200 times the RMDL of 0.005 mg/L). Oleic acid was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG 26: Pimaric Acid

Pimaric acid was selected as a candidate parameter at twenty-two mills; however, the data from four of the mills, Canadian Pacific (Dryden), MacMillan-Bloedel, E.B. Eddy (Ottawa) and Sonoco, are unacceptable for effluent limits setting. The average pimaric acid concentration in process effluent ranged from 0.01 mg/L to 1.0 mg/L (2 to 200 times the RMDL of 0.005 mg/L). Pimaric acid was removed from further consideration in the effluent limits setting process because it cannot be controlled to predictable, quantifiable levels with the identified BAT treatment technologies.

ATG M8: Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand (BOD) was selected as a candidate parameter at all of the mills; however, the data from one of the mills, MacMillan-Bloedel, are unacceptable for effluent limits setting. The average BOD concentration in process effluent ranged from 17.3 mg/L to 1,279 mg/L (3.5 to 256 times the RMDL of 5.0 mg/L). Biochemical oxygen demand discharges can be controlled to predictable, quantifiable levels with the identified BAT treatment technologies, therefore, effluent limits have been developed for this parameter.

ATG M13: Adsorbable Organic Halide (AOX)

Adsorbable Organic Halide (AOX) was selected as a candidate parameter at ten mills. The average AOX concentration in process effluent ranged from 1.78 mg/L to 45.0 mg/L (35.6 to 900 times the RMDL of 0.05 mg/L). Adsorbable organic halide discharges can be controlled to predictable, quantifiable levels with the identified BAT treatment technologies, therefore, effluent limits have been developed for this parameter.

In addition to the parameters for which technically defendable effluent limits can be developed based on MISA effluent monitoring data and BAT treatment technology, effluent limits have also been developed for 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF). 2,3,7,8-TCDF was not monitored under the effluent monitoring regulation but will be regulated under the effluent limits regulation because of the significant threat that it poses to human health and the environment.

Table 5.1 presents the final list of parameters that will be limited for the pulp and paper sector.

Table 5.1
The Final Parameter List

ATG	Parameter
6	Total Phosphorus
8	Total Suspended Solids (TSS)
16	Chloroform
17	Toluene
20	Phenol
24	2,3,7,8-TCDD
	2,3,7,8-TCDF
M8	BOD, 5 day, Total Demand
M13	Adsorbable Organic Halide (AOX)

5.2 THE EFFLUENT LIMITS SETTING PROCESS

Effluent limits were developed for process effluent according to the statistical procedures outlined in the Issue Resolution Committee Reports on Monitoring Data Analysis and Limit Setting and Form of Limits[1]. Daily and monthly average production-based loading limits were calculated for each parameter using BAT plant performance data. These limits were then multiplied by mill reference production rates to calculate plant specific loading limits for each mill site.

Daily and monthly average loading limits were calculated for each parameter according to the following steps:

Step 1 An average production-based flowrate, expressed in terms of cubic metres of effluent per tonne of product, was calculated as the arithmetic average of the production-based flowrates for each BAT plant.

Step 2 An average LTA concentration, expressed in terms of milligrams of contaminant per litre of effluent, was calculated for each limited parameter as the arithmetic average of the parameter LTA concentrations for each BAT plant.

Step 3 Average daily and monthly variability factors were calculated for each limited parameter as the arithmetic average of the respective daily and monthly variability factors for each BAT plant.

Step 4 Daily and monthly average production-based loading limits, expressed in terms of kilograms of contaminant per tonne of product, were calculated for each limited parameter as the product of the average production-based flowrate, the average parameter LTA concentration and the respective average variability factor.

Step 5 Daily and monthly average plant loading limits, expressed in terms of kilograms of contaminant per day, were calculated for each limited parameter as the product of the daily and monthly average production-based loading limits and the respective plant reference production rate.

5.3 EFFLUENT LIMITS SETTING

Plants with BAT treatment technology were identified according to the criteria outlined in the Issue Resolution Committee Report on Best Available Technology[2]. Performance data from three mills with exemplary secondary treatment, which is considered the "preferred option" for the pulp and paper sector, were used to set effluent limits. Performance data from E.B. Eddy (Espanola) and Kimberly-Clark (Terrace Bay) in Ontario and from Weldwood (Hinton) in Alberta were used to set limits because of the high quality of effluent that is discharged from each mill following secondary treatment. Effluent limits were developed as follows:

STEP 1: THE AVERAGE PRODUCTION-BASED FLOWRATE

The first step in the effluent limits setting process was to calculate the average production-based flowrate for the BAT mills. The 1990 average production data and flowrate data for Kimberly-Clark (Terrace Bay) and Weldwood (Hinton) were used to calculate an average production-based flowrate. Flow measurement data from E.B. Eddy (Espanola) were not used because of problems with the flow measurement device for the mill. Table 5.2 lists the average production-based flowrates for Kimberly-Clark (Terrace Bay) and Weldwood (Hinton).

Table 5.2
Average Production-Based Flowrates

Mill	Average Production (tonne/day)	Average Flow (m^3/day)	Average Production-Based Flow (m^3/tonne)
Kimberly-Clark (Terrace Bay)	1,110	91,695	83
Weldwood (Hinton)	1,006	90,000	89
Average Flowrate			86

STEP 2: AVERAGE LTA CONCENTRATIONS

The second step in the effluent limits setting process was to calculate the average LTA concentration of each of the parameters to be limited using data from the three BAT plants. The average LTA concentration for each parameter was calculated as the arithmetic mean of the parameter LTA concentrations for each BAT plant. Since the LTA concentrations of toluene and phenol in the treated process effluent from E.B Eddy (Espanola) and Kimberly-Clark (Terrace Bay) were less than the respective regulation method detection limits (RMDLs) for each parameter, the LTA average concentrations for toluene and phenol were set at the respective RMDLs for the purpose of effluent limits setting.

LTA concentrations were not calculated for 2,3,7,8-TCDD and 2,3,7,8-TCDF because the effluent limits regulation will require legally enforceable non-measurable concentrations of 2,3,7,8-TCDD (<20 ppq) and 2,3,7,8-TCDF (<50 ppq) in all mill effluent due to the significant threat these chemicals pose to human health and the environment.

Table 5.3 lists the average LTA concentrations to three significant figures for the candidate parameters selected for effluent limits setting.

Table 5.3
Long-term Average Concentrations

Parameter	Kimberly-Clark	E.B. Eddy (Espanola)	Weldwood (Hinton)	Average
BOD, 5 day, Total Demand (mg/L)	15.7	17.3	25.7	19.6
Total Suspended Solids (mg/L)	42.5	25.0	35.6	34.4
Adsorbable Organic Halide (AOX) (mg/L)	21.2	8.20	10.9	13.4
Total Phosphorus (mg/L)	0.489	0.512	1.13	0.710
Chloroform (µg/L)	12.0	16.4	N/A	14.2
Toluene (µg/L)	•	•	•	0.500
Phenol (µg/L)	•	•	•	2.40

Legend
N/A = no data available
• = Data not used in the calculation of the long-term average concentration.

STEP 3: DAILY AND MONTHLY VARIABILITY FACTORS

The third step in the effluent limits setting process was to calculate daily and monthly variability factors for each limited parameter. Variability factors take into account analytical and sampling uncertainty, process and plant variations, treatment process fluctuations and operational changes. Daily and monthly variability factors were calculated according to the statistical procedures outlined in the Issue Resolution Committee Report on Monitoring Data Analysis.

The daily variability factor, VF_1, is used to set daily maximum performance values and is calculated as the ratio of the 99th percentile of the concentration data to the expected mean based on the distribution of the data.

The monthly variability factor, either VF_4 or VF_{30} depending on whether 4 or 30 samples are collected during the month, is used to set monthly average performance values and is calculated as the ratio of the 95th percentile of the concentration data to the expected mean based on the distribution of the data.

In order to estimate variability factors for toluene and phenol where the majority of the data were at lower concentrations than the respective regulation method detection limits, it was necessary to review the quality assurance/quality control data for each parameter. For toluene, small corrections were made to the analytical test results by the laboratories performing the analyses in order to take into account analytical error. Therefore, the Ministry decided to use a variability factor of 5 in order to set effluent limits at the level of the regulation method detection limit.

For the parameter phenol, there were no corrections made to the analytical test results by the laboratories performing the analyses, therefore, the Ministry decided to use a variability factor of 2 in order to set effluent limits at the level of the regulation method detection limit.

Tables 5.4 and 5.5 list the daily and monthly variability factors to three significant figures for the candidate parameters to be limited with the exception of the parameters 2,3,7,8-TCDD and 2,3,7,8-TCDF which are treated separately.

Table 5.4
Daily Variability Factors (VF_1)

Parameter	Kimberly-Clark	E.B. Eddy (Espanola)	Weldwood (Hinton)	Average
BOD, 5 day, Total Demand	2.66	4.36	1.64	2.89
Total Suspended Solids	1.62	2.28	2.66	2.19
Adsorbable Organic Halide (AOX)	1.38	1.74	1.44	1.52
Total Phosphorus	1.64	1.88	2.99	2.17
Chloroform	2.76	3.33	N/A	3.05
Toluene	*	*	*	3
Phenol	*	*	*	2

<u>Legend</u>
N/A = no data available
* = Data not used in calculation of daily variability factor.

Table 5.5
Monthly Variability Factors (VF_4 or VF_{30})

Parameter	Factor Type	Kimberly-Clark	E.B. Eddy (Espanola)	Weldwood (Hinton)	Average
BOD, 5 day, Total Demand	VF_{30}	1.40	1.47	N/A	1.44
Total Suspended Solids	VF_{30}	1.15	1.43	N/A	1.29
Adsorbable Organic Halide (AOX)	VF_4	1.15	1.26	1.14	1.18
Total Phosphorus	VF_4	1.17	1.26	1.52	1.32
Chloroform	VF_4	1.47	1.60	N/A	1.54
Toluene	VF_4	*	*	*	3
Phenol	VF_4	*	*	*	2

<u>Legend</u>
N/A = no data available
* = Data not used in the calculation of the monthly variability factor.

OUTLIER REVIEW

The effluent monitoring data were reviewed in order to evaluate the effect of extreme or outlier values on the average LTA concentrations and daily and monthly variability factors that were calculated for each parameter. Extreme or outlier values may result from plant and process upsets, QA/QC problems, sampling errors or other unknown causes. They may be non-representative of normal plant operating conditions or may be indicative of other environmental problems requiring investigation.

Extreme or outlier values were removed from the database (outliers excluded) and a comparison was made to the original database (outliers included). The data (outliers excluded and outliers included) for each parameter were reviewed and it was concluded that all of the data (outliers included) should be used for effluent limits setting because the data reflect normal plant operations of the BAT mills over the effluent monitoring period.

LTA concentration results and daily and monthly variability factors are presented in Tables 5.6 to 5.8 to three significant figures for both sets of data in order to show the effects of outlier removal.

Table 5.6
Long-term Average Concentrations (Outliers Included and Outliers Excluded)

Parameter	RMDL	LTA (outliers included)	LTA (outliers excluded)
BOD, 5 day, Total Demand	5 mg/L	19.6	18.7
Total Suspended Solids	5 mg/L	34.4	33.7
Adsorbable Organic Halide (AOX)	0.05 mg/L	13.4	13.4
Total Phosphorus	0.1 mg/L	0.710	0.662
Chloroform	0.7 µg/L	14.2	13.0

Legend
RMDL = Regulation Method Detection Limit

Table 5.7
Daily Variability Factors (VF_1)
(Outliers Included and Outliers Excluded)

Parameter	Daily Variability Factor (outliers included)	Daily Variability Factor (outliers excluded)
BOD, 5 day, Total Demand	2.89	2.07
Total Suspended Solids	2.19	2.10
Adsorbable Organic Halide (AOX)	1.52	1.43
Total Phosphorus	2.17	1.88
Chloroform	3.05	2.79

Table 5.8
Monthly Variability Factors (VF_4 or VF_{30})
(Outliers Included and Outliers Excluded)

Parameter	Factor Type	Monthly Variability Factor (outliers included)	Monthly Variability Factor (outliers excluded)
BOD, 5 day, Total Demand	VF_{30}	1.44	1.31
Total Suspended Solids	VF_{30}	1.29	1.28
Adsorbable Organic Halide (AOX)	VF_4	1.18	1.18
Total Phosphorus	VF_4	1.32	1.28
Chloroform	VF_4	1.54	1.48

STEP 4: DAILY AND MONTHLY AVERAGE PRODUCTION-BASED LOADING LIMITS

The fourth step in the effluent limits setting process was to calculate daily and monthly average production-based loading limits, expressed in terms of kilograms of contaminant per tonne of product, for each parameter to be controlled. These limits were calculated as follows:

$$\text{Daily Production-Based Limit (kg/tonne)} = \frac{\text{Flow} \times \text{LTAc} \times \text{VF1}}{1000}$$

$$\text{Monthly Average Production-Based Limit (kg/tonne)} = \frac{\text{Flow} \times \text{LTAc} \times \text{VF4 or VF30}}{1000}$$

where:

Flow = average production-based flowrate (m^3/tonne)
LTAc = average LTA concentration (mg/l)
VF1 = daily variability factor
VF4 = monthly variability factor based on the collection of four samples during the month for compliance purposes
VF30 = monthly variability factor based on the collection of thirty samples during the month for compliance purposes

In order to review the technical development of the production-based loading limits and the mill specific plant loading limits, an Effluent Limit Setting Subcommittee (ELSS) was formed under the MISA Pulp and Paper Sector Joint Technical Committee. The subcommittee consisted of representatives from the Ontario Ministry of the Environment, the Ontario pulp and paper industry and Environment Canada. During the technical review of the BAT plant performance data, the industry members of the Effluent Limits Setting Subcommittee identified several concerns with the applicability of some of the performance data to Ontario mills.

The industry members of the subcommittee presented data that showed that bleached kraft mills generally discharge more AOX when bleaching softwood than when bleaching hardwood. The industry subcommittee members argued that effluent limits should be based on 100% softwood furnish in order to reflect the fact that Ontario mills use a combination of softwood and hardwood furnish.

After reviewing the data submitted by industry, the ministry members of the subcommittee agreed that AOX limits should be developed based on the use of 100% softwood furnish since mills currently bleaching hardwood could find themselves bleaching softwood in the future due to market pressures and available wood supply.

The industry members of the subcommittee also presented data that showed that mills that use softwood furnish discharge higher levels of BOD. The ministry members of the subcommittee reviewed the data and concluded that after secondary treatment, there should be no difference in the quality of the treated mill effluent since the quality of the effluent depends primarily on the design and operation of the effluent treatment system.

The industry members of the subcommittee expressed concerns with the cold weather performance of biological effluent treatment systems, specifically aerated stabilization basins treating sulphite-mechanical mill effluent. The industry members of the subcommittee argued that with the exception of ASB's treating sulphate (kraft) mill effluent, ASB treatment performance is reduced during cold weather operation and sulphite-mechanical mills that install ASB's may have problems in meeting the proposed limits. The ministry members of the subcommittee agreed that the performance of ASB treatment systems treating sulphite-mechanical mill effluent may be affected by cold weather operation but noted that mills should take these factors into account when designing and selecting the type of effluent treatment system to be installed at the mill.

Finally, the industry members of the subcommittee questioned whether all of the Ontario mills, given the age and diversity of the mills, could be successfully modified to discharge the same quality of effluent as the identified BAT mills. They noted that the majority of Ontario mills are quite old and it may not be possible to retrofit all of the mills to achieve the same quality of effluent discharge as the identified BAT mills. The ministry members of the subcommittee responded that these concerns should be taken into account when designing the necessary in-plant process modifications and external treatment systems to comply with the pulp and paper sector effluent limits.

After much debate, the industry and ministry members of the ELS subcommittee agreed that some of the mills in the province may have problems in meeting effluent limits based purely on BAT plant performance data. Recognizing that it would be highly desirable to develop effluent limits that could be applied uniformly and equitably across the sector, the subcommittee recommended that all of the mills should meet BOD and TSS monthly average production-based loading limits of 5 kg/tonne and 7.87 kg/tonne respectively. The subcommittee also recommended that mills that bleach pulp using chlorine and chlorine-containing compounds should meet a monthly average AOX production-based loading limit of 1.5 kg/tonne. These limits were based on BAT plant performance data and on the best professional judgement of the ELS subcommittee as to what could be readily achieved by all mills in the sector.

The monthly average production-based limits recommended by the ELS subcommittee were used to revise the average LTA concentrations for each parameter by dividing the limits by the 86 m^3/tonne average production-based flowrate and by the respective monthly variability factor for each parameter. Table 5.9 lists the BOD, TSS and AOX average LTA concentrations that were originally calculated using BAT plant performance data and the 'revisions' that were recommended by the ELS subcommittee.

Table 5.9
Calculated and Revised Average LTA Concentrations

Parameter	Calculated BAT Long-term Average Concentration (mg/L)	Revised Long-term Average Concentration (mg/L)
BOD, 5 day, Total Demand	19.6	40.4
Total Suspended Solids	34.4	70.9
Adsorbable Organic Halide (AOX)	13.4	14.8

Table 5.10 presents the daily and monthly average production-based loading limits that were recommended by the ELS subcommittee based on BAT plant performance data and best professional judgement where appropriate. The limits were calculated for each parameter by multiplying the average production based flowrate by the average parameter LTA concentration and appropriate variability factor.

Table 5.10
ELS Subcommittee Recommended Production-Based Loading Limits

Parameter	Average LTA Concentration (mg/L)	Daily Variability Factor	Monthly Variability Factor	Estimated LTA (kg/tonne)	Daily Limit (kg/tonne)	Monthly Average Limit (kg/tonne)
BOD, 5 day, Total Demand	40.4	2.89	1.44	3.47	10.0	5.00
Total Suspended Solids	70.9	2.19	1.29	6.10	13.4	7.87
Adsorbable Organic Halide (AOX)	14.8	1.52	1.18	1.27	1.93	1.50
Total Phosphorus	0.71	2.17	1.32	0.0611	0.133	0.0806
Chloroform	* 14.2	3.05	1.54	0.00122	0.00372	0.00188
Toluene	* 0.50	5	5	0.0000430	0.000215	0.000215
Phenol	* 2.40	2	2	0.000206	0.000413	0.000413

Legend
* = micrograms per litre

Note
Mill specific plant loading limit (kg/day) = production-based loading limit (kg/tonne) x mill reference production rate (tonnes/day)
Estimated LTA (kg/tonne) = average production based flowrate (m^3/tonne) x average LTA concentration (mg/L)/1000

MINISTRY AND INDUSTRY REVIEW

Following the deliberations of the effluent limits setting subcommittee, the proposed production-based limits were presented to the Ontario Ministry of Environment and the Ontario pulp and paper industry for review.

Following their review of the proposed limits, industry argued that many of the proposed limits were too stringent and would place an undue financial burden on some of the Ontario mills. Industry felt that two issues in particular warranted further consideration, namely the need for biological treatment of mill effluent and the basis for the AOX limit.

The ministry review of the proposed production-based limits indicated that the limits were not stringent enough because some of the mills were currently operating at levels well below the proposed limits. In order to resolve the concerns with the proposed effluent limits, a Pulp and Paper Working Group was formed within the ministry to review the proposed limits and, if necessary, develop a more appropriate set of limits.

The Pulp and Paper Working Group conducted a detailed review of the BAT plant performance data, the recommendations of the report on Best Available Technology for the Ontario Pulp and Paper Industry, existing mill Control Orders and Certificates of Approval and pulp and paper regulations in other states, provinces and countries. The working group specifically reviewed the average LTA concentration values which the ELS subcommittee used to develop their recommended limits and reviewed the arguments put forth by the industry and ministry members of the subcommittee. Based on this review, the Pulp and Paper Working Group accepted the LTA concentration values recommended by the ELS subcommittee for BOD and TSS.

For the control of adsorbable organic halides (AOX), the Pulp and Paper Working group reviewed existing ministry policy along with new ministry policy covering pollution prevention at source, zero discharge and toxics reduction. The Pulp and Paper Working Group reviewed all of the latest scientific and technical information on the environmental significance of organochlorine discharges, measured as AOX, and concluded that while there is much debate over the environmental significance of AOX and its use as a regulatory parameter, it is well known that many chlorinated organics are persistent and bioaccumulative and are known mutagens and potential carcinogens.

Referring to existing government policy, the Pulp and Paper Working Group noted that the 1978 Ontario Water Management Policy when dealing with potent potential carcinogens, such as dioxins and PCBs, has been to reduce to the lowest practicable level existing discharges and not to permit new discharges. This policy is based on a general recognition of the potency of a specific chemicals and not on site-specific environmental impact analyses.

The Pulp and Paper Working Group recommended that since AOX is a surrogate parameter for a large number of chlorinated organic compounds, some of which are highly toxic, persistent and bioaccumulative, the most appropriate and responsible action would be to adopt a "precautionary principle" in dealing with the control of organochlorine discharges.

The "precautionary principle" is consistent with Ontario Government Policy for dealing with substances that are persistent and bioaccumulative and that potentially can have significant long-term impact on the ecosystem. Accordingly, the Pulp and Paper Working Group recommended to the Minister that the discharge of organochlorines from pulp and paper mill bleach plants should be eventually phased out using a regulated staged reduction.

The Pulp and Paper Working Group recommended that pulp and paper mills that use chlorine and chlorine compounds to bleach pulp be required to meet the following regulated monthly average production-based loading limits:

- 1.5 kg AOX/tonne of bleached kraft pulp by December 31, 1995
- 0.8 kg AOX/tonne of bleached kraft pulp by December 31, 1999.

The Pulp and Paper Working Group also recommended that pulp and paper mills that use chlorine and chlorine compounds to bleach pulp be required to submit 'AOX Elimination Plans' with the goal of achieving zero AOX discharge by the end of the year 2002. This goal is consistent with the new MISA initiatives of the zero discharge of persistent toxic substances announced by the Minister in September, 1991.

For the parameter phosphorus, the working group recommended that the average LTA concentration used to set effluent limits be increased from 0.71 mg/L to 0.76 mg/L which would make the basis for the total phosphorus monthly limit consistent with the International Joint Commission recommended limit of 1 mg/L. For the remaining parameters, namely chloroform, toluene and phenol, the Pulp and Paper Working Group accepted the LTA concentration values recommended by the ELS subcommittee.

The Pulp and Paper Working Group had a major concern with the approach of applying one set of limits to all of the mills in the sector in that many of the mills were already operating at levels well below the effluent limits proposed by the ELS subcommittee. The working group looked at various ways of adjusting the proposed limits which would take into account the variety of mills in the sector and finally concluded that the most appropriate approach to take would be to vary the average production-based flowrate for each category of mill and set category specific production-based limits.

For mills in the sulphate (kraft) and sulphite-mechanical categories, the working group agreed that the flowrate of 50 m^3/tonne suggested by the BAT consultant was overly restrictive as it would be extremely difficult for mills in these categories to reduce their flow to the 50 m^3/tonne level. Therefore, the working group recommended that the flowrate of 86 m^3/tonne, which was the average production-based flowrate suggested by the ELS subcommittee, be used to set limits.

For mills in the corrugating and deinking/board/fine papers/tissue categories, the working group recommended that the average production-based flowrate of 50 m^3/tonne suggested by the BAT consultant, be used to set effluent limits for all of the limited parameters with the exception of toluene.

For the parameter, toluene, the working group recommended that since toluene discharges are independent of mill size (ie. toluene is not directly used nor generated in the pulp and papermaking process), one limit should be developed for the sector based on the 86 m^3/tonne flowrate.

The pulp and paper working group also recommended that the BOD limit for Noranda Forest (Thorold) be based on the 86 m^3/tonne flowrate used to set limits for the sulphate (kraft) and sulphite-mechanical categories. The Noranda Forest mill produces fine paper from purchased pulp and recycled and deinked waste paper. Starch coatings from the waste paper contribute to high BOD loadings in the effluent and as a result, it would be very difficult for the mill to comply with BOD effluent limits based on the 50 m^3/tonne flowrate.

Table 5.11 lists the average production-based flowrates recommended by the Pulp and Paper Working Group for each mill category.

Table 5.11
Category Specific Average Production-Based Flowrates

Category	Flowrate (m^3/tonne)
Sulphate (Kraft)	86
Sulphite-Mechanical	86
Corrugating	50
Deinking/Board/Fine Papers/Tissue	50

The average production-based flowrates recommended by the Pulp and Paper Working Group were used to calculate production-based loading limits for each category of mill. Tables 5.12 and 5.13 list the production-based loading limits for the sulphate (kraft) and sulphite-mechanical categories respectively and tables 5.14 and 5.15 list the production-based loading limits for mills in the corrugating and deinking/board/fine papers/tissue categories respectively.

Table 5.12
Production-Based Loading Limits for the Sulphate (Kraft) Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	10.0	5.00	3.47
Total Suspended Solids	13.4	7.87	6.10
AOX - Day One - December 31, 1995 - December 31, 1999	3.22 1.93 1.03	2.50 1.50 0.800	2.12 1.27 0.678
Total Phosphorus	0.142	0.0863	0.0654
Chloroform	0.00372	0.00188	0.00122
Toluene	0.000215	0.000215	0.0000430
Phenol	0.000413	0.000413	0.000206
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

<u>Legend</u>
NM = Non-Measurable
AOX = Adsorbable Organic Halide

<u>Note</u>
Mill Limit (**kg/day**) = Production-Based Limit x Mill Reference Production Rate

Table 5.13
Production-Based Loading Limits for the Sulphite-Mechanical Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	10.0	5.00	3.47
Total Suspended Solids	13.4	7.87	6.10
Total Phosphorus	0.142	0.0863	0.0654
Chloroform	0.00372	0.00188	0.00122
Toluene	0.000215	0.000215	0.0000430
Phenol	0.000413	0.000413	0.000206
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

Legend
NM = Non-Measurable

Note
Mill Limit (kg/day) = Production-Based Limit x Mill Reference Production Rate

Table 5.14
Production-Based Loading Limits for the Corrugating Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	5.84	2.91	2.02
Total Suspended Solids	7.76	4.57	3.55
Total Phosphorus	0.0825	0.0502	0.0380
Chloroform	0.00217	0.00109	0.000710
Toluene	0.000215	0.000215	0.0000430
Phenol	0.000240	0.000240	0.000120
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

Legend
NM = Non-Measurable

Note
Mill Limit = Production-Based Limit x Mill Reference Production Rate

Table 5.15
Production-Based Loading Limits for the Deinking/Board/Fine Papers/Tissue Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	5.84	2.91	2.02
Total Suspended Solids	7.76	4.57	3.55
Total Phosphorus	0.0825	0.0502	0.0380
Chloroform	0.00217	0.00109	0.000710
Toluene	0.000215	0.000215	0.0000430
Phenol	0.000240	0.000240	0.000120
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

Legend
NM = Non-Measurable

Note
Mill Limit = Production-Based Limit x Mill Reference Production Rate

STEP 5: DAILY AND MONTHLY AVERAGE PLANT LOADING LIMITS

Daily and monthly average plant loading limits were calculated for each mill by multiplying the production-based loading limits for the mill by the mill's reference production rate. The mill's reference production rate is the production rate that was exceeded on only 10% of the days that the mill operated during the first six months of 1990. It reflects mill production under normal operating conditions and corresponds quite closely with standard engineering design assumptions for selecting mill equipment.

The total mill reference production rate, which represents the number of tonnes of machine dry product leaving the mill, was used to calculate daily and monthly average limits for all of the parameters except AOX. The bleached kraft reference production rate, which represents the number of air dry tonnes of bleached kraft pulp leaving the bleach plant, was used to calculate daily and monthly average limits for AOX.

Table 5.16 lists the total mill and bleached kraft reference production rates that were used to calculate the daily and monthly average plant loading limits that are presented in Appendix I of the Development Document.

Table 5.16
Reference Production Rates

Mill Name	Total Mill Production Rate (tonnes/day)	Bleached Kraft Production Rate (tonnes/day)
Abitibi-Price (Fort William)	428	
Abitibi-Price (Iroquois Falls)	906	
Abitibi-Price (Provincial Papers)	489	
Beaver Wood (Thorold)	347	
Boise Cascade (Fort Frances)	1,094	587
Boise Cascade (Kenora)	1,057	
CP Forest Products (Dryden)	1,258	915
CP Forest Products (Thunder Bay)	2,584	1,540
Domtar (Cornwall)	856	480
Domtar (Red Rock)	976	75
Domtar (St. Catharines)	196	
Domtar (Trenton)	382	
E.B. Eddy (Espanola)	1,216	1,216
E.B. Eddy (Ottawa)	234	
James River-Marathon (Marathon)	523	523
Kimberly-Clark (Huntsville)	118	
Kimberly-Clark (St. Catharines)	114	
Kimberly-Clark (Terrace Bay)	1,308	1,308
MacMillan-Bloedel (Sturgeon Falls)	301	
Malette (Smooth Rock Falls)	390	390
Noranda Forest Products (Thorold)	284	
Quebec & Ontario (Thorold)	1,004	
St. Marys Paper (Sault Ste. Marie)	629	
Sonoco (Trenton)	342	
Spruce Falls (Kapuskasing)	1,096	
Strathcona (Napanee)	217	

5.4 LOADING REDUCTIONS

The proposed effluent limits for the pulp and paper sector represent a significant step forward in the overall protection of human health and aquatic life in Ontario and are a major step forward towards the ministry's goal of the virtual elimination of persistent toxic substances.

In order to comply with the proposed limits the pulp and paper sector will have to reduce biochemical oxygen demand (BOD) discharges by 84% (287,249 kg/day) which is roughly equivalent to the amount of raw sewage generated by 3.2 million people. Total suspended solids (TSS) discharges will have to be reduced by 5% (4948 kg/day) which is onerous in that all of the mills in the Ontario already have treatment in place for TSS removal. AOX discharges will have to be reduced by 52% (8,086 kg/day) by December 31, 1995 and by 75% (11,539 tonnes/day) by December 31, 1999. When the goal of zero AOX discharge is finally achieved by December 31, 2002, over 15,000 kg/day of AOX will have been removed from effluent discharges to the environment.

Compliance with the proposed limits may result in a 16% (133 kg/day) increase in the amount of total phosphorus discharged to the environment because total phosphorus is added as a nutrient to biological effluent treatment systems in order to maximize BOD removal. While the limits for total phosphorus are based on the International Joint Commission recommended monthly average discharge limit of 1 mg/litre, the amount of total phosphorus discharged by the sector may increase due to the large number of mills that will have to install new biological treatment systems in order to meet the BOD limits.

The discharges of chloroform, phenol and toluene will also be greatly reduced by compliance with the proposed limits. Chloroform discharges will be reduced by 96% (435 kg/day), toluene discharges by 84% (3.4 kg/day) and phenol discharges by 88% (22.2 kg/day).

It is anticipated that significant reductions will occur in the loadings of many other toxic substances because most mills will install biological treatment in order to comply with the regulated limits. These substances will include metals, volatile and non-volatile organic compounds, fatty and resin acids, and chlorinated organic compounds. Exact loading reductions for these substances cannot be determined since it is very difficult to predict the levels of reduction that will occur for each substance as a result of biological treatment.

For the eight kraft mills that bleach pulp, the reductions in the loadings of chlorinated organic compounds will be in addition to the reductions that will occur as the direct result of reducing the amount of chlorine used for bleaching.

Table 5.17 presents the estimated loading reductions for each regulated parameter, with the exception of 2,3,7,8-TCDD and 2,3,7,8-TCDF.

Table 5.17
Loading Removal Summary (kg/day)
For the Pulp and Paper Sector

Parameter	1990 Loading	Total Load Removed	Estimated Load Remaining	Percent Removal
BOD, 5 day, Total Demand	340,047	287,249	52,798	84
Total Suspended Solids	97,073	4,948	92,125	5
AOX - Day One	15,493	3,129	12,364	20
- December 31, 1995	15,493	8,086	7,407	52
- December 31, 1999	15,493	11,539	3,954	74
Total Phosphorus	854	(133)	987	(16)
Chloroform	453	435	18	96
Toluene	4.1	3.4	0.7	83
Phenol	25.3	22.2	3.1	88

Legend
AOX = Adsorbable Organic Halide
Numbers in brackets are negative.

Note
Even though the effluent limits for total phosphorus are based on the International Joint Commission recommended monthly limit of 1 mg/litre, total phosphorus discharges may increase by up to 16% due to the installation of biological effluent treatment.

5.5 COMPARISON WITH OTHER JURISDICTIONS

The proposed limits for Ontario were compared to those for Quebec and British Columbia which both have large pulp and paper industries. For the parameters BOD and TSS, the proposed limits for Ontario are more stringent than those for Quebec and British Columbia. Table 5.18 presents the effluent limits for each province.

For the parameter AOX, the proposed limits for Ontario are more stringent than those for Quebec and are comparable to those for British Columbia. Quebec is following a staged approach to AOX reduction with a regulated limit of 0.8 kg/tonne by December 31, 2000. While Ontario is proposing a staged approach with a regulated AOX limit of 0.8 kg/tonne by December 31, 1999, Ontario is also proposing the goal of zero AOX discharge by December 31, 2002. While British Columbia has regulated zero AOX discharge, Ontario is proposing the goal of zero AOX discharge by December 31, 2002 in order to give Ontario mills more flexibility in achieving zero AOX discharge.

For the parameters total phosphorus, chloroform, toluene and phenol, Ontario is the only province to propose effluent limits. For the parameters 2,3,7,8-TCDD and 2,3,7,8-TCDF, Ontario is proposing non-measurable concentrations in the effluent which is consistent with the Federal Government limits for these parameters. Quebec is following a toxics equivalency approach in setting effluent limits for these parameters.

All three provinces have similar requirements for non-lethal effluent, however, Ontario is proposing that pulp and paper mill effluent is also non-lethal to Daphnia magna (water fleas) as well as to rainbow trout.

The proposed limits for Ontario were also compared to the new Federal pulp and paper limits and to the limits for Finland, Sweden and the United States which also have large pulp and paper industries. The Ontario limits are more stringent than the Federal limits and while it is difficult to compare effluent limits from other countries due to different analytical test protocols and sampling procedures, the proposed Ontario limits appear to be comparable to those for Finland, Sweden and the United States. Table 5.19 presents the new Federal effluent limits and the effluent limits for Finland, Sweden and the United States.

Table 5.18
Comparison with Limits for Quebec and British Columbia (kg/tonne)

	Ontario (Proposed)	Quebec (2)	B.C.
Promulgation	1993	1992	1990
Compliance	1995	1995	1991 to 1995
BOD, 5 day, Total Demand	2.9-5.0 (1)	5.0 9.0 (3)	7.5 21.0 (5)
Total Suspended Solids	4.6-7.9 (1)	8.0	11.25 37.50 (5)
Adsorbable Organic Halide (AOX)	1.5 by Dec. 31, 1995 0.8 by Dec. 31, 1999 Goal of 0 by Dec. 31, 2002	1.5 (HWD) + 2.5 (SWD) by Dec. 31, 1993 1.0 (HWD) + 2.0 (SWD) by Sept. 30, 1995 0.8 by Dec. 31, 2000	1.5 by Dec. 31, 1995 and 0 by Dec. 31, 2002 or 0 by Dec. 31, 2000
Total Phosphorus	0.05-0.09 (1)		
2,3,7,8-TCDD	Non-measurable	see (4)	
2,3,7,8-TCDF	Non-measurable	see (4)	
Toxicity	LC50>100%	Non-Lethal to Trout	LC50>100%

<u>Note</u> Proposed Ontario limits for chloroform, toluene and phenol are not shown.

<u>Legend</u>
(1) Limits vary with category of mill.
(2) All Quebec limits are net values.
(3) If treatment system is over 80% efficient.
(4) Total of dioxins and furans not to exceed 15 ppq as 2,3,7,8-TCDD (TEQ)
(5) Sulphite mills only.
SWD = softwood
HWD = hardwood

Table 5.19
Comparison with Federal Limits and with Limits for Finland, Sweden and the United States (kg/tonne)

	Ontario (Proposed)	Canada	Finland	Sweden	USA
BOD	2.9 - 5.0 (1)	7.5		1.7 - 7.5	2.8 - 8.1
TSS	4.6 - 7.9 (1)	11.25		0.3 - 5.8	4.6 - 16.4
Adsorbable Organic Halide (AOX)	1.5 by Dec. 31, 1995 0.8 by Dec. 31, 1999 Goal of 0 by Dec. 31, 2002		2.0 by 1995 (2) 1.0 by 1995 (3)	1.0 by 1995 and 0.5 by 2000 (2) 0.5 by 1995 and 0.3 by 2000 (3)	
Total Phosphorus	0.05 - 0.09 (1)		0.06		
2,3,7,8-TCDD	Non-measurable	Non-measurable			
2,3,7,8-TCDF	Non-measurable	Non-measurable			
Toxicity	LC50>100%	LC50>100%			See (4)

Note Proposed Ontario limits for chloroform, toluene and phenol are not shown.

Legend
(1) Limits vary with category of mill.
(2) Annual average for mills using softwood.
(3) Annual average for mills using hardwood.
(4) One of the following, depending upon the State:
a) Non-lethal at 100% concentration
b) LC90 > 100
c) Concentration at edge of mixing zone must not exceed one-third LC50

5.6 REFERENCES

1. Ontario Ministry of the Environment (1990). MISA Issue Resolution Process Issue Resolution Committee Reports. Toronto, Ontario. ISBN 0-7729-7354-7

2. Ibid.

THE EFFLUENT LIMITS REGULATION

CHAPTER 6

OF THE

DEVELOPMENT DOCUMENT

TABLE OF CONTENTS

LIST OF TABLES

6.1 INTRODUCTION

The purpose of the Effluent Limits Regulation is to improve the quality of effluent that is discharged directly to surface watercourses by Ontario pulp and paper mills. This will be accomplished by:

- controlling the allowable discharge of specific pollutants
- requiring all effluent to be non-acutely lethal
- requiring mills that bleach pulp using chlorine and chlorine-containing compounds to prepare plans for the elimination of AOX.

This chapter describes the main features of the effluent limits regulation for the pulp and paper sector.

6.2 THE EFFLUENT LIMITS REGULATION

Definitions

Section 1 of the regulation provides the definitions of terms used in the Regulation in order to clarify the meaning of those terms which may have different interpretations and to explain technical terms which may not be in common usage.

Application

The Regulation applies to the twenty-six direct discharge pulp and paper mills in Ontario. The mills are listed in Schedule 1 of the Regulation.

Compliance: Plant Loading Limits

The main compliance requirements of the Regulation come into force on December 31, 1995. The regulated limits are listed in Schedule 2 of the Regulation and apply to process effluent only. If a mill fails to comply with the requirements of Schedule 2 and a limit is exceeded, then it is subject to enforcement action by the Ministry.

The following types of limits apply to process effluent:

- *Daily plant loading limits*

  A mill must not exceed the daily plant loading limits listed in Column 3 of Schedule 2 on any operating day.

- *Monthly average plant loading limits*

  A mill must not exceed the monthly average plant loading limits listed in Column 4 of Schedule 2 during any month of the year.

All mill effluent must be discharged through designated sampling points only. A mill must not discharge process effluent that has a pH below 6.0 or above 9.5 at any time.

AOX limits differ from the limits for the other parameters in that there will be a regulated staged reduction in the discharge of AOX with the ultimate goal of zero AOX discharge by the year 2002. Mills for which an AOX limit is listed are required to comply with the "day one" limit for AOX on the day the regulation is filed. Mills are then required to meet more rigorous AOX limits by December 31, 1995 and by December 31, 1999.

Compliance: Acute Lethality

A mill must not discharge process or cooling water effluent that is acutely lethal to either rainbow trout or Daphnia magna. An acutely lethal effluent is one that kills more than fifty percent of the test species in 100 percent (undiluted) effluent.

Sampling and Analytical Procedures

In order to ensure the accurate sampling and analysis of effluent samples, standard sampling and analytical procedures have been developed by the Ministry. The Ministry protocol on sampling and analysis[1] outlines how a mill must collect a sample, how the sample should be analyzed and the minimum analytical method detection level that the laboratory must achieve when analyzing the sample.

Each mill must insure that all sampling equipment is properly maintained and operated in order to ensure that a representative sample is collected.

Sampling Points

A mill must designate sampling points that allow representative samples to be collected for all process effluent and once-through cooling water effluent. All samples collected for the Regulation must be taken from these designated sampling points.

Loading Calculations: Daily Plant Loadings

In order to determine compliance with the daily plant loading limits, daily loadings for each limited parameter must be calculated for each process effluent. This is done by multiplying the analytical test result of the monitored parameter by the flowrate of the monitored effluent stream for the day of sampling.

The following rules must be observed when calculating parameter loadings:

- If the parameter was not detected in the effluent and the method detection limit for the parameter is greater than or equal to 1/10th of the analytical method detection limit listed in the Ministry protocol on sampling and analysis[1], then the value of the method detection limit must be used.

- If the parameter was not detected in the effluent and the method detection limit for the parameter is less than 1/10th of the analytical method detection limit listed in the Ministry protocol on sampling and analysis[1], then the value of zero must be used.

If there is more than one process effluent at a mill then the daily plant loading is the sum of the individual process effluent loadings. If the calculated loading of the limited parameter exceeds the daily plant loading limit for that parameter, then the mill is considered to be out of compliance with the requirements of the Regulation.

Loading Calculations: Monthly Average Plant Loadings

In order to determine compliance with the monthly average plant loading limits, a monthly average plant loading for each limited parameter must be calculated. The monthly average plant loading for a parameter is calculated as the average (arithmetic mean) of the daily plant loadings reported for the month. If the calculated loading of the limited parameter exceeds the monthly average plant loading limit for that parameter, then the mill is considered to be out of compliance with the requirements of the Regulation.

Loading Calculations: Cooling Water Loadings

Each mill is also required to calculate a daily cooling water plant loading and a monthly average cooling water plant loading for reporting to the Ministry.

Reference Production Rates and Revised Parameter Limits

Each mill may revise plant loading limits annually to reflect production changes at the mill. The plant loading limits for each mill contained in Schedule 2 of the regulation are based on the mill reference production rates in Schedule 4. A mill's reference production rate is equal to the quantity of bleached kraft pulp or finished product, produced daily at the mill, that was exceeded on only 10% of the days that the mill operated during the year. The reference production rate to be used in revising plant loading limits is the highest value from the past three years. New plant loading limits are obtained by multiplying the unit of production loading limits for each parameter contained in Schedule 2A by the mill's new reference production rate.

Process Effluent Monitoring

Using 24-hour composite sampling techniques, each mill is required to collect process effluent samples daily, weekly, and quarterly. The daily, weekly, and quarterly samples must be analyzed for the parameters for which the frequency of monitoring is indicated in Column 2 of Schedule 2 as being daily, weekly, and quarterly respectively.

Table 6.1 lists the limited parameters and the frequency of monitoring for each parameter.

Table 6.1
Limited Parameters and Monitoring Frequency

ATG	Parameter	Frequency
3	pH	Daily
6	Total Phosphorus	Weekly
8	Total Suspended Solids	Daily
16	Chloroform	Weekly
17	Toluene	Weekly
20	Phenol	Weekly
24	2,3,7,8-tetrachlorodibenzo-p-dioxin	Quarterly
24	2,3,7,8-tetrachlorodibenzofuran	Quarterly
M8	BOD, 5 day, Total Demand	Daily
M13	Adsorbable Organic Halide (AOX)	Weekly

Process Effluent Monitoring: Reduced Frequency

If for twelve consecutive months, the monthly average plant loading of a limited parameter is less than or equal to fifty percent of the mill's monthly average plant loading limit then the mill may commence monitoring for that parameter at a reduced frequency. The monitoring frequency for parameters monitored on a daily basis can be reduced to three times per week and parameters monitored on a weekly basis can reduce to bi-weekly. If while monitoring at a reduced frequency the loading calculated for a parameter is greater than fifty percent of the monthly average plant loading limit for two consecutive months then the reduced frequency ceases to apply.

Quality Control Monitoring

Each mill must collect once per year from one process effluent sampling point a set of quality control samples for those parameters listed in Schedule 2 under weekly monitoring. The set of quality control samples must include:

- a travelling blank sample for the parameters total phosphorus, chloroform, toluene, phenol and AOX (if limited at the mill)
- a duplicate or replicate sample for the parameters total phosphorus, chloroform, toluene, phenol and AOX (if limited at the mill)
- a travelling spiked blank sample for chloroform, toluene and phenol.

The samples for quality control monitoring must be collected on the same day as the regular compliance monitoring samples for the limited parameters. Procedures for collecting the quality control samples are outlined in the Ministry of the Environment "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater[1]".

Process Effluent Monitoring: pH

Mills must install on-line pH analyzers on each process effluent stream for continuous pH monitoring.

Acute Lethality Testing

During the first year that the Regulation is in effect, each mill is required to conduct monthly acute lethality tests in order to determine whether the mill's process effluent or once-through cooling water effluent is acutely lethal to rainbow trout or Daphnia magna. The Environment Canada protocols on acute toxicity testing[2,3] describe the required sampling and analytical procedures to be followed when conducting the acute lethality tests.

A mill is allowed to reduce the acute lethality monitoring frequency to a quarterly basis for the test species for which an effluent is found to be non acutely lethal for 12 consecutive months.

Chronic Toxicity Testing

When a mill passes twelve consecutive acute lethality tests for both rainbow trout and Daphnia Magna for samples collected from both process and cooling water effluents, it is required to start conducting chronic toxicity tests. These tests should be conducted every six months on Ceriodaphnia dubia and fathead minnows. The Environment Canada protocols on chronic toxicity testing[4,5] describe the required sampling and analytical procedures to be followed when conducting these tests.

Assessment Monitoring: Once-Through Cooling Water

Once-through cooling water effluent is to be monitored once per week for assessment purposes. Table 6.2 lists the required parameters to be monitored.

Table 6.2
Once-Through Cooling Water Effluent
Assessment Monitoring Parameters

Analytical Test Group	Parameter
1	Chemical Oxygen Demand (COD)
3	pH
5a	Dissolved Organic Carbon (DOC)
7	Specific Conductance
8	Total Suspended Solids

Flow Measurement

In order to determine daily and monthly plant loadings, each mill must continuously measure the daily flow of all process effluent streams. Each process effluent flow measurement device must:

- be accurate to within ±15%
- be installed properly and be easily accessible for inspection by a provincial officer and,
- be maintained and calibrated according to a predetermined maintenance schedule based on good operating practices.

Each mill must also measure the flow of once-through cooling water on the day that samples are collected. Each cooling water effluent flow measurement device must:

- be accurate to within ±20% and
- be maintained in the same manner as the process effluent flow measurement devices.

Effluent Volumes

Each mill must calculate the daily plant volume of process effluent that is discharged each day that the mill is in operation. The mill must also calculate the daily plant volume of once-through cooling water effluent that is discharged on the days that once-through cooling water effluent samples are collected.

At the end of each month the mill must calculate the monthly average volume of process effluent and the monthly average volume of cooling water effluent discharged during the month by taking the average (arithmetic mean) of the daily plant volumes reported for each stream during the month.

Storm Water Control Study:

Each mill must complete a storm water control study within two years after the Regulation comes into force or by December 31, 1996 if changes are made that will alter the quality or quantity of storm water discharged by the plant. The storm water control study should be conducted according to the Ministry of the Environment protocol for conducting a storm water control study[6].

Record Keeping:

Each discharger must keep all records specified by the regulation for a period of three years and upon request make them available to the Ministry for inspection. Record keeping requirements include the following:

- all concentration, pH, flow and toxicity test results in an electronic format for each process effluent and once-through cooling water effluent stream.

- all malfunctions related to effluent sampling, chemical analysis, toxicity testing, and flow measurement or other problems that interfere with meeting the requirements of the regulation.

- daily production for each of the products listed in Schedule 4 of the regulation.

- any discharge of process effluent not discharged through a process effluent monitoring stream detailing the date, duration, cause and nature of the discharge.

Reporting:

Each mill must provide to the Ministry:

- An annual summary of all test results (concentration, pH, flow and toxicity) and all non-compliance events that exceeded loading or pH limits on or before June 1st of the following calendar year.

- Notification, within thirty days, if the mill has operated for more than 90 consecutive days at less than seventy-five percent of the reference production rate.

- Notification to the director, as soon as possible, of any exceedance of a daily or monthly average plant loading limit, failure to meet pH requirements for any period of more than fifteen consecutive minutes, or any failure to meet the acute lethality limits.

- A quarterly summary, within 45 days of the end of the three-month period. The quarterly summary should contain the following:

    - monthly average loadings and minimum and maximum daily loadings for the parameters for which monitoring is required and all non-compliance events that exceeded the loading limits

    - average monthly and minimum/maximum daily flows for both process and cooling water effluent

    - the number of days throughout each month that each process effluent stream and cooling water effluent stream discharge effluent

    - the average pH range of each process effluent stream and all non-compliance events that exceeded the pH limits

- Notification, as soon as possible, of any process effluent that is not discharged through the designated sampling point for that effluent

- A summary of all chronic toxicity test results within 60 days after the semi-annual period in which the samples were collected

- an AOX Elimination Plan (AEP) for mills that use chlorine or chlorine compounds to bleach pulp. The plan should describe the methods by which the mill proposes to eliminate AOX discharges

  A preliminary "outline" of the plan is required 6 months after the regulation comes into force, an "interim" plan before December 31, 1995 and a "final" plan before December 31, 1998

  Mills must demonstrate their progress toward achieving the zero AOX discharge goal by submitting annual progress updates to the Ministry.

Timing:

Each mill must start monitoring and reporting the results of all tests ninety days after the Regulation is filed. The "day one" limit on AOX applies on the day that the regulation is filed while the other limits come into force on December 31, 1995.

6.3 REFERENCES

1. Ontario Ministry of the Environment (1991). Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater. Toronto, Ontario.

2. Environment Canada (1990). Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. Toronto, Ontario.

3. Environment Canada (1990). Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. Toronto, Ontario.

4. Environment Canada (1992). Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia. Toronto, Ontario.

5. Environment Canada (1992). Test of Larval Growth and Survival Using Fathead Minnows. Toronto, Ontario.

6. Ontario Ministry of the Environment (1992). MISA Protocol For Conducting A Storm Water Control Study. Toronto, Ontario.

THE DRAFT REGULATION

APPENDIX I

OF THE

DEVELOPMENT DOCUMENT

DraftP&P.Jan,1993

ONTARIO REGULATION ??/??

under the Environmental Protection Act

DRAFT EFFLUENT LIMITS REGULATION

FOR THE

PULP AND PAPER SECTOR

This Draft Regulation has not been finally reviewed by the Registrar of Regulations or by counsel of the Registrar of Regulations, and may be subject to wording changes.

Ministry of Environment

January, 1993

DraftP&P.Jan,1993

LIST OF CONTENTS

Definitions

1.-(1) In this Regulation,

"combined effluent means effluent that originates from or comes into contact by design with any industrial process or process materials and that is mixed with cooling water effluent or stormwater effluent prior to discharge to a surface water;

"cooling water effluent" means water and associated material that is used in an industrial process for the purpose of removing heat and, by design, does not come into contact with process materials, but does not include blowdown from recirculating cooling water systems;

"cooling water effluent monitoring stream" means a cooling water effluent stream on which a sampling point is required to be established under section 6;

"cooling water effluent sampling point" means a sampling point designated under section 6;

"direct discharger" means an owner or person in occupation or having the charge, management or control of a plant that discharges effluent to a surface water;

"Director", in respect of obligations on a direct discharger, means a director appointed under section 5 of the Environmental Protection Act and responsible for the region in which the direct discharger's plant is located and includes an alternate named by the Director;

"final treatment process" means the last treatment process through which an effluent passes before the effluent is discharged to surface water;

"limited parameter", in relation to a direct discharger's plant, means a parameter for which a limit is specified in columns 3 of schedule 2 for the plant;

"month" means a calendar month;

"operating day" means all or part of 24 consecutive hours during which process effluent is being discharged from a direct discharger's plant;

"plant" means an industrial facility and the developed property and waste disposal sites associated with it;

"process change" means a change in equipment, production process, process materials or treatment process;

"process effluent" means effluent that originates from or comes into contact by design with any industrial process or process materials, and includes continuous and intermittent discharges, combined effluent, blowdown from recirculating cooling water systems, waste disposal site effluent and waste waters discharged during a maintenance shut-down period for all or part of the plant;

"process effluent monitoring stream" means a process effluent stream on which a sampling point is required to be established under section 6.

"process effluent sampling point" means a sampling point designated under section 6 of this Regulation.

"process materials", in relation to a direct discharger's plant, means raw materials for use in an industrial process at the plant, manufacturing intermediates produced at the plant, or products or by-products of an industrial process at the plant, but does not include chemicals added to once-through cooling water for the purpose of controlling organisms, fouling and corrosion;

"reference production rate", means the production rate for a direct discharger's plant as set out in schedule 4.

"quarter" means all or part of a period of three consecutive months beginning on the first day of January, April, July and October;

"schedule 3 parameter", in relation to a direct discharger's plant, means a parameter listed in Schedule # for monitoring at the plant;

"semi-annual period" means all or part of a period of six months beginning on the first day of January and July;

"set of samples" means all of the samples that must be collected on a given operating day from all of the sampling points established under section 6 at a discharger's plant, for the purposes of analysing for the parameters listed in schedules 2 and 3 for that discharger's plant;

"storm water effluent" means run-off from a storm event or thaw that is discharged from a discharger's plant either directly or indirectly to a surface water;

"surface water" means a lake, river, pond, stream, reservoir, swamp, marsh or surface drainage works;

"Waste disposal site effluent" means effluent discharged from any waste disposal site other than a waste disposal site used solely for the storage, for use as fuel, of wood wastes, bark or both;

"week" means a period of seven days commencing at midnight on Saturday and ending at midnight on the following Saturday;

The purpose of this Regulation is, through the application of monitoring and limits, to control the discharge to surface waters of substances listed in schedule 2, to assess the discharge to surface waters of substances listed in schedule 3, and to require mills to prepare plans for the elimination of AOX.

Application

2. This Regulation applies only with respect to the plants listed in schedule 1.

Parameter Limits

3.-(1) The daily plant loading limits for process effluents, listed in column 3 of schedule 2 for a discharger's plant, shall not be exceeded for any operating day.

(2) The monthly average plant loading limits for process effluents, listed in column 4 of schedule 2 for a discharger's plant, shall not be exceeded for any month.

(3) The concentration of hydrogen ion in each process effluent monitoring stream at a discharger's plant at the point of discharge of that effluent to a surface water, shall be controlled so that the Ph value (analytical test group 3) of each stream is not outside the range of 6.0 to 9.5.

(4) A direct discharger shall not discharge a process effluent from the discharger's plant except through a process effluent monitoring stream.

Adsorbable Organic Halide (AOX) Limits

(5) Each direct discharger for which a limit for AOX is listed in columns 3 and 4 of schedule 2 for that discharger's plant, shall ensure that on the day after this regulation is filed, the daily plant loading and the monthly average loading for the parameter AOX at that discharger's plant, calculated in accordance with section 8, does not exceed the "day one" limit for AOX listed in columns 3 and 4 , respectively, of schedule 2 for that discharger's plant.

(6) Each direct discharger for which a limit for AOX is listed in columns 3 and 4 of schedule 2 for that discharger's plant, shall ensure that by the thirty-first day of December, 1995, the daily plant loading and the monthly average loading for the parameter AOX at that discharger's plant, calculated in accordance with section 8, does not exceed the "December 31, 1995" limit for AOX listed in columns 3 and 4 , respectively, of schedule 2 for that discharger's plant.

(7) Each direct discharger for which a limit for AOX is listed in columns 3 and 4 of schedule 2 for that discharger's plant, shall ensure that by the thirty-first day of December, 1999, the daily plant loading and the monthly average loading for the parameter AOX at that

discharger's plant, calculated in accordance with section 8, does not exceed the "December 31, 1999" limit for AOX listed in columns 3 and 4, respectively, of schedule 2 for that discharger's plant.

(8) Each direct discharger shall from time to time as requested by the director, provide the Director with plans, schedules and progress reports for achieving the requirements of subsections (6) and (7).

Lethality Limits

4. Each direct discharger shall control the quality of each process effluent monitoring stream and each cooling water effluent monitoring stream at the discharger's plant to ensure that any rainbow trout acute lethality test or any Daphnia magna acute lethality test performed on any grab sample under section 9 results in mortality for no more than fifty percent of the test organisms in one-hundred percent effluent.

Sampling and Analytical Procedures

5.-(1) For the purposes of this Regulation, the location of sampling points and sampling and analysis including quality control sampling and analysis, shall be performed in accordance with the procedures described in the Ministry publication entitled "Protocol for the Sampling and Analysis of Industrial/ Municipal Wastewater" dated October, 1991.

(2) Each direct discharger shall maintain the sampling equipment used at designated sampling points at a direct discharger's plant in a way that ensures the collection of samples that are characteristic of the effluent.

Sampling Points

6.-(1) Each direct discharger shall, within ninety days of this Regulation coming into force or within thirty days of the stream coming into existence, whichever is later, ensure that a sampling point is established on each process effluent stream at the discharger's plant in accordance with the sampling point location requirements of subsection (5).

(2) A direct discharger need not establish a sampling point on a process effluent stream that flows into another process effluent stream if the samples collected at the sampling point on the merged stream are characteristic of the effluent in the contributing stream.

(3) If the samples collected at a sampling point on the merged stream cease to be characteristic of the effluent in the contributing stream, the direct discharger shall, within thirty days of the change, ensure that a sampling point is established on the contributing stream.

(4) For the purposes of subsections (2) and (3), a sample collected at a sampling point on a merged stream is characteristic of the effluent in a contributing stream if analysis of the sample from the merged stream would consistently yield a positive analytical result for every limited parameter for which a sample from the contributing stream taken in the same way at the same time would yield a positive analytical result.

(5) A sampling point on a process effluent stream shall be established at a location on the stream that,

(a) allows the collection of samples representative of the effluent in the stream;

(b) is downstream of final treatment on the stream, if any;

(c) in the case of a stream that goes through treatment, is upstream of any mixing with cooling water effluent or stormwater effluent occurring after final treatment on the stream; and

(d) in the case of a stream that does not go through any treatment, is upstream of any mixing with once-through cooling water effluent or stormwater effluent.

(6) Each direct discharger shall, within ninety days of this Regulation coming into force or within thirty days of the stream coming into existence, ensure that a sampling point is established on each cooling water effluent stream at the discharger's plant in accordance with the sampling point location requirements of subsection (8).

(7) Subsections (2) to (4) apply with necessary modifications to cooling water effluent streams and, for the purpose, a reference in subsections (2) to (4) to a process effluent stream shall be deemed to be a reference to a cooling water effluent stream.

(8) A sampling point on a cooling water effluent stream shall be established at a location on the stream that,

(a) allows the collection of samples representative of the effluent in the stream; and

(b) is upstream of any mixing with process effluent or stormwater effluent.

(9) Within ninety days after this Regulation comes into force, each direct discharger shall submit to the Director a list and plot plan showing the sampling points required to be established within that ninety day period under subsections (1) and (6).

(10) If a sampling point established on a direct discharger's stream no longer meets the sampling point location requirements of this section or no longer permits the collection of samples from the stream as required by this Regulation, whether because of a process change, an installation of a waste treatment works, an alteration of a waste treatment works, a redirection of an effluent stream or any other change, the direct discharger shall, as soon as is reasonably possible, establish an alternate sampling point on the stream in accordance with the sampling point location requirements of this section.

(11) A direct discharger may replace a sampling point established on a stream under this section with an alternate sampling point at a new location on the stream, so long as the alternate sampling point accords with the sampling point location requirements of this section.

(12) As soon as is reasonably possible but in any case within thirty days after establishing a new sampling point under subsection (1), (3), (6), (7), (10) or (11), the direct discharger shall give the Director a written notice describing the location of the new sampling point, together with a revised version of the list and plot plan submitted under subsection (9) showing the new sampling point.

(13) Subject to subsection 16.-(2), each direct discharger shall use the sampling points established under this section for all sampling required by this Regulation.

Calculations - Loadings

7.-(1) For the purposes of performing a calculation under sections 8 and 9, a direct discharger shall use the actual analytical result obtained by the laboratory.

(2) Despite subsection (1), where the actual analytical result is less than one-tenth of the analytical method detection limit set out in the Ministry publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" dated October, 1991, the direct discharger shall use the value zero for the purpose of performing a calculation under this section.

(3) Each direct discharger shall ensure that each calculation required by this section is performed as soon as possible after the analytical result on which the calculation is based becomes available to the discharger.

Calculations - Reference Production Rates

7a.-(1) Commencing in 1996 and thereafter each year, each direct discharger may calculate a revised reference production rate for bleached pulp, and finished product for that discharger's plant.

(2) For the purposes of subsection (1), the reference production rate for any year for bleached pulp is equal to the highest value of the 90th percentile of the daily production of bleached pulp at the discharger's plant for any of the previous three years.

(3) For the purposes of subsection (1), the reference production rate for any year for finished product is equal to the highest value of the 90th percentile of the daily production of finished product at the discharger's plant for any of the previous three years.

(4) The 90th percentile of the daily production of finished product at a plant for a year is the statistically derived value that is equal to the quantity of finished product, produced daily by the plant, that was exceeded on 10 percent of the days that the plant operated in the year.

(5) For the purposes of subsections (2) and (3), the finished product is the tonnes of pulp or paper product that has completed the production process at a plant and is calculated on an air-dry basis.

(6) Each direct discharger that calculates a revised reference production rate under subsection (1), shall notify the Director, in writing, no later than the thirty-first day of January of each year, of the value of the revised reference production rate.

Calculations - Revised Parameter Limits

7b.-(1) Commencing in 1996 and thereafter each year, each direct discharger may calculate revised parameter limits for that discharger's plant.

(2) For the purposes of subsection (1), a revised daily loading limit and a revised monthly average loading limit for each parameter shall be calculated by multiplying the revised reference production rate as calculated under section 7a., by the respective daily and monthly unit of production loading limits for each parameter as set out in schedule 2A for the respective category for the discharger's plant.

(3) Each direct discharger that calculates revised parameter limits under subsection (1) shall notify the Director, in writing, no later than the thirty-first day of January of each year, of the value of the revised parameter limits.

(4) For the purposes of section 3(1), the revised daily loading limits calculated under subsection (1) shall replace the respective

daily loading limits listed in column 3 of Schedule 2.

(5) For the purposes of section 3(2), the revised monthly average loading limits calculated under subsection (1) shall replace the respective monthly average loading limits listed in column 4 of Schedule 2.

Calculation of Process Effluent Loadings

8.-(1) Each direct discharger shall calculate, in kilograms, a daily process effluent stream loading for each limited parameter in each process effluent stream of the discharger for each day on which a sample is collected under this Regulation from the stream for analysis for the parameter.

(2) When calculating a daily stream loading under subsection (1), the direct discharger shall multiply, with suitable adjustment of units to yield a result in kilograms, the analytical result obtained from the sample for the parameter by the total volume of effluent discharged on the day from the stream.

(3) For the purposes of subsection (2), the total volume of effluent discharged on an operating day from an effluent stream is the volume as calculated under section 23.

(4) Each direct discharger shall calculate a daily process effluent plant loading for each limited parameter for each day in respect of which the discharger is required to calculate a daily process effluent stream loading under subsection (1).

(5) For the purposes of subsection (4), a daily process effluent plant loading for a parameter for a day is the sum, in kilograms, of the daily stream loadings for the parameter calculated under subsection (1) for the day.

(6) Where a direct discharger calculates only one daily process effluent stream loading under subsection (1), the daily process effluent plant loading for the purposes of subsection (4) is the single daily process effluent stream loading.

(7) Each direct discharger shall calculate, in kilograms, a monthly average process effluent plant loading for each limited parameter for each month in which a sample is collected under this Regulation more than once from a process effluent stream at the discharger's plant for analysis for the parameter.

(8) For the purposes of subsection (7), a monthly average process effluent plant loading for a parameter for a month is the arithmetic mean of the daily process effluent plant loadings for the parameter calculated under subsection (4) for the month.

Calculation of Cooling Water Effluent Loadings

9.-(1) Each direct discharger shall calculate, in kilograms, a daily cooling water effluent stream loading for each Schedule 3 parameter in each cooling water effluent stream of the discharger for each day on which a sample is collected under this Regulation from the stream for analysis for the parameter.

(2) When calculating a daily stream loading under subsection (1), the direct discharger shall multiply, with suitable adjustment of units to yield a result in kilograms, the analytical result obtained from the sample for the parameter by the total volume of effluent discharged on the day from the stream.

(3) For the purposes of subsection (2), the total volume of effluent discharged on an operating day from an effluent stream is the volume as calculated under section 23.

(4) Each direct discharger shall calculate a daily cooling water effluent plant loading for each Schedule 3 parameter for each day in respect of which the discharger is required to calculate a daily cooling water effluent stream loading under subsection (1).

(5) For the purposes of subsection (4), a daily cooling water effluent plant loading for a parameter for a day is the sum, in kilograms, of the daily stream loadings for the parameter calculated under subsection (1) for the day.

(6) Where a direct discharger calculates only one daily cooling water effluent stream loading under subsection (1), the daily cooling water effluent plant loading for the purposes of subsection (4) is the single daily cooling water effluent stream loading.

(7) Each direct discharger shall calculate, in kilograms, a monthly average cooling water effluent plant loading for each Schedule 3 parameter for each month.

(8) For the purposes of subsection (7), a monthly average cooling water effluent plant loading for a parameter for a month is the arithmetic mean of the daily cooling water effluent plant loadings for the parameter calculated under subsection (4) for the month.

Monitoring

10.-(1) For the purposes of this Regulation, composite samples of process effluent and cooling water effluent shall be collected and analyzed in accordance with the procedures described in the Ministry publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" dated October, 1991.

(2) Where a direct discharger is required under this Regulation to collect composite samples, those samples shall be collected over an operating day.

(3) Despite subsection (2), where a direct discharger has more than one process effluent monitoring stream and is required on an operating day to collect a composite sample from each stream at the discharger's plant, the discharger may designate any period of twenty-four consecutive hours for each stream provided that the discharger;

i. specifies to the Director in writing no later than thirty days after this Regulation comes into force, the sampling commencement time for each stream and maintains those times from day to day, and

ii. commences the sampling of all streams on the same calendar day.

(4) Where a direct discharger has more than one process effluent monitoring stream and is required on an operating day to collect a set of samples from each stream at the discharger's plant, the discharger shall collect all samples in the set from each stream on the same operating day.

(5) Despite subsection (2), where a direct discharger has more than one cooling water effluent monitoring stream and is required on an operating day to collect a composite sample from each stream at the discharger's plant, the discharger may designate any period of twenty-four consecutive hours for each stream provided that the discharger,

i. specifies to the Director in writing no later than thirty days after this Regulation comes into force, the sampling commencement time for each stream and maintains those times from day to day, and

ii. commences the sampling of all streams on the same calendar day.

(6) Where a direct discharger has more than one cooling water effluent monitoring stream and is required on an operating day to collect a set of samples from each stream at the discharger's plant, the discharger shall collect all samples in the set from each stream on the same operating day.

(7) A direct discharger shall use all reasonable efforts to ensure that all analyses required by this Regulation are completed as soon as possible and that the results of those analyses are made available to the discharger as soon as possible.

Monitoring - Process Effluent - Daily Limits

11.-(1) Each direct discharger shall collect a set of samples from each process effluent sampling point during each operating day, and shall analyze each set of samples for the parameters for which the frequency of monitoring, set out in column 2 of schedule 2 for the discharger's plant, is daily.

(2) A direct discharger need not meet the requirements of subsection (1) where it is impossible to do so because of sampling by a provincial officer.

Monitoring - Process Effluent - Weekly Limits

12.-(1) Each direct discharger shall collect a set of samples from each process effluent sampling point on one operating day during each week, and shall analyze each set of samples for the parameters for which the frequency of monitoring, set out in column 2 of schedule 2 for the discharger's plant, is weekly.

(2) For the purposes of subsection (1), a set of samples collected from a process effluent sampling point after the first set of samples is collected from that point shall be collected no sooner than three days after the previous sampling from that sampling point.

Monitoring - Process Effluent - Quarterly Limits

13.-(1) Each direct discharger shall collect a set of samples from each process effluent sampling point on one operating day during each quarter, and shall analyze each set of samples for the parameters for which the frequency of monitoring, set out in column 2 of schedule 2 for the discharger's plant, is quarterly.

(2) For the purposes of subsection (1), a set of samples collected from a process effluent sampling point after the first set of samples is collected from that point shall be collected no sooner than forty-five days after the previous sampling from that sampling point.

Monitoring - Process Effluent - Reduced Frequency

14.-(1) Where, for twelve consecutive months of monitoring under subsection 11(1), the monthly average plant loading of a daily parameter is equal to or less than fifty percent of the limit for the parameter as set out in column 4 of schedule 2 for a direct discharger's plant, the frequency of monitoring for the parameter may be reduced to three times per week.

(2) Subsection 1 ceases to apply if the monthly average plant loading of a parameter is greater than fifty percent of the limit for the parameter as set out in column 4 of schedule 2 for the discharger's plant, for two consecutive months and the discharger shall instead sample in accordance with the requirements of subsection 11(1).

(3) Where, for twelve consecutive months of monitoring under subsection 12(1), the monthly average plant loading of a weekly parameter is equal to or less than fifty percent of the limit for the parameter as set out in column 4 of schedule 2 for a direct discharger's plant, the frequency of monitoring for the parameter may be reduced to bi-weekly.

(4) Subsection (3) ceases to apply if the monthly average plant loading of a parameter is greater than fifty percent of the limit for the parameter as set out in column 4 of schedule 2 for the discharger's plant, for two consecutive months and the discharger shall instead sample in accordance with the requirements of subsection 12(1).

(5) A direct discharger shall notify the Director in writing of any changes in the frequency of monitoring at the discharger's plant made under subsections (1) through (4), within thirty days after the day on which a change occurs.

Monitoring - Process Effluent - Quality Control

15.-(1) Each direct discharger shall collect or prepare the quality control samples required by subsections (2) and (3) in accordance with the procedures described in the Ministry publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" dated October, 1991.

(2) Once per year, each direct discharger shall collect from one process effluent sampling point at the discharger's plant, a duplicate or replicate sample for each sample collected on that day from that sampling point under subsection 12(1), and shall analyze each duplicate or replicate sample for the parameters for which the frequency of monitoring set out in column 2 of schedule 2 for the discharger's plant is weekly.

(3) Once per year, on the day on which duplicate or replicate samples are collected under subsection (2), each direct discharger shall prepare a travelling blank and travelling spiked blank sample for each sample collected on that day from one process effluent sampling point under subsection 12(1), and shall analyze the travelling blank and travelling spiked blank sample for the parameters for which the frequency of monitoring set out in column 2 of schedule 2 for the discharger's plant is weekly.

(4) A direct discharger need not analyze a travelling blank sample collected under subsection (3) for parameters in analytical test groups (ATGs) 3 and 8 listed in schedule 1 of the Ministry publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater", October, 1991.

(5) A direct discharger shall only analyze a travelling spiked blank sample collected under subsection (3) for parameters in analytical test groups (ATGs) 16 to 20, 23 and 26 listed in schedule 1 of the Ministry publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater", October, 1991.

Monitoring - Process Effluent - pH Measurement

16.-(1) Each direct discharger shall ensure that the pH of each process effluent monitoring stream at the discharger's plant is measured during each operating day, using an on-line analyzer.

(2) For the purposes of this section, a direct discharger shall use either the sampling point established under section 6 on the stream or an alternate sampling point located downstream of the sampling point but before the point of discharge of the stream to surface water.

(3) Before using an alternate sampling point under subsection (2), a direct discharger shall give the Director a written notice describing the location of the alternate sampling point, together with a revised version of the list and plot plan submitted under subsection 6(9) showing the alternate sampling point.

(4) If an on-line analyzer used by a direct discharger for the purpose of measuring pH under this section is not operational due to a problem of malfunction, maintenance or calibration for a period of more than twenty-four consecutive hours, for every subsequent operating day that the on-line analyzer is not operational, that discharger shall instead collect eight grab samples throughout each operating day, at approximately three-hour intervals, from the sampling point on which the analyzer is located, and shall analyze each sample for the parameter pH.

Monitoring - Acute Lethality Testing - Rainbow Trout

17.-(1) Where a direct discharger is required to perform a rainbow trout acute lethality test, the discharger shall perform the test according to the procedures described in the Environment Canada publication entitled "Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" dated July, 1990.

(2) Once in each month and on the same operating day, each direct discharger shall collect a grab sample from each process effluent

sampling point and each cooling water effluent sampling point at the discharger's plant, and shall perform a rainbow trout acute lethality test on each sample.

(3) Each direct discharger shall carry out each rainbow trout acute lethality test as a single concentration test using one hundred percent effluent and shall record the result.

(4) For the purposes of subsection (2), a sample collected from a sampling point after the first sample is collected from that point shall be collected no sooner than fifteen days after the previous sampling from that sampling point.

(5) Where a direct discharger has performed twelve consecutive tests under subsection (2) on a sample collected from the same sampling point and the mortality of the rainbow trout in each test has not exceeded fifty percent, the discharger is relieved of the obligations under subsection (2) and may instead collect a grab sample once per quarter from that sampling point and perform a rainbow trout acute lethality test on that sample.

(6) For the purposes of subsection (5), a sample collected from a sampling point after the first sample is collected from that point shall be collected no sooner than forty-five days after the previous sampling from that sampling point.

(7) If a rainbow trout acute lethality test performed under subsection (5) on any sample from a sampling point results in mortality for more than fifty percent of the test fish, subsections (5) and (6) cease to apply in respect to samples from that sampling point, and a direct discharger shall instead test in accordance with the requirements of subsection (2) until the tests performed under subsection (2) on all samples from that sampling point for a further twelve consecutive months result in mortality for no more than fifty per-cent of the fish for each test.

(8) Where a direct discharger reasonably believes that the testing of an effluent stream would result in mortality to more than fifty percent of the test fish, the discharger shall so acknowledge to the Director in writing, and is then relieved of the obligations to perform a rainbow trout acute lethality test under subsection (2) until section 4 of this regulation comes into force.

(9) For the purposes of subsection (2), each direct discharger shall collect each sample from each process effluent sampling point at the discharger's plant on one of the days on which a set of samples is collected at the discharger's plant under subsections 12(1) or 14(3).

(10) For the purposes of subsections (5) and (7), a direct discharger shall notify the Director in writing of any changes in the frequency of acute lethality testing at the discharger's plant, within thirty days after the day on which a change occurs.

Monitoring - Acute Lethality Testing - Daphnia Magna

18.-(1) Where a direct discharger is required by this Regulation to perform a Daphnia magna acute lethality test, the discharger shall perform the test according to the procedures described in the Environment Canada publication entitled "Reference Method for Determining Acute Lethality of Effluents to Daphnia magna" dated July, 1990.

(2) Subsections 17(2) to (10) apply with necessary modifications to Daphnia magna acute lethality tests.

(3) Each direct discharger shall collect all samples required by rainbow trout acute lethality tests and Daphnia magna acute lethality tests on the same day.

Monitoring - Chronic Toxicity Testing - Ceriodaphnia

19.-(1) Where a direct discharger is required to perform a 7-day Ceriodaphnia reproduction inhibition and survivability test, the discharger shall perform the test according to the procedure described in the Environment Canada publication entitled "Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia" dated February, 1992.

(2) Once in each semi-annual period and on the same operating day, each direct discharger shall collect a grab sample from each process effluent sampling point and each cooling water effluent sampling point at the discharger's plant, and shall perform a 7-day Ceriodaphnia reproduction inhibition and survivability test on each sample.

(3) For the purposes of subsection (2), a sample collected from a sampling point after the first sample is collected from that point shall be collected no sooner than ninety days after the previous sampling from that sampling point.

(4) Subsection (2) does not apply until twelve consecutive monthly rainbow trout and Daphnia magna acute lethality tests performed on samples collected from process effluent and once-through cooling water effluent sampling points at a direct discharger's plant result in mortality for no more than fifty percent of the test organisms in one hundred percent effluent.

(5) For the purposes of subsection (2), each direct discharger shall collect each sample from each process effluent sampling point at the discharger's plant on one of the days on which a set of samples is collected at the discharger's plant under subsections 12(1) or 14(3).

Monitoring - Chronic Toxicity Testing - Fathead Minnow

20.-(1) Where a direct discharger is required to perform a 7-day fathead minnow growth inhibition test, the discharger shall perform the test according to the procedure described in the Environment Canada publication entitled "Test of Larval Growth and Survival Using Fathead Minnows" dated February, 1992.

(2) Subsections 19(2) to (5) apply, with necessary modifications, to fathead minnow chronic toxicity tests.

(3) Each direct discharger shall collect all samples required by Ceriodaphnia chronic toxicity tests and fathead minnow chronic toxicity tests on the same day.

Monitoring - Cooling Water - Weekly Assessment

21.-(1) Each direct discharger shall collect a set of samples from each cooling water effluent sampling point at the discharger's plant on one operating day during each week, and shall then analyze each set of samples for the parameters listed in schedule 3 for the discharger's plant.

(2) For the purposes of subsection (1), a set of samples collected from a cooling water effluent sampling point after the first set of samples is collected from that point shall be collected no sooner than three days after the previous sampling from that sampling point.

Flow Measurement

22.-(1) Subject to subsection (2), each direct discharger shall determine in cubic metres the daily volume of effluent in each process effluent monitoring stream at the discharger's plant throughout each operating day, by integration of continuous flowrate measurements.

(2) A direct discharger that has process effluent monitoring streams that discharge on an intermittent basis throughout an operating day at the discharger's plant, shall determine the daily volume of effluent from each of the streams throughout an operating day, either by integration of continuous flowrate measurements or by the summation of individual batch volume measurements.

(3) Each direct discharger shall use flow measurement methods which allow the volume of effluent discharged from each process effluent monitoring stream at the discharger's plant to be determined to an accuracy of within <u>plus or minus fifteen percent</u>.

(4) Each direct discharger shall determine the daily volume in cubic metres of effluent in each cooling water effluent monitoring stream at the discharger's plant, throughout each operating day on which a set of samples is collected for analysis under section 21.

(5) Each direct discharger shall use flow measurement methods which allow the volume of effluent discharged from each cooling water effluent monitoring stream at that discharger's plant, to be determined to an accuracy of within plus or minus twenty percent.

(6) Each direct discharger shall, no later than the day that this section comes into force, determine by calibration methods or confirm by means of a certified report of a registered professional engineer of the Province of Ontario that each flow measurement method or system used under subsections (1) and (2) meets the accuracy requirements of subsection (3) and those used under subsection (4) meet the accuracy requirements of subsection (5).

(7) Where a direct discharger installs a new flow measurement method or system or alters an existing flow measurement method or system, the discharger shall determine by calibration methods or confirm by means of a certified report of a registered professional engineer of the Province of Ontario that each new or altered flow measurement method or system meets the accuracy requirements of either subsections (3) or subsection (5) within two weeks after the day on which the new or altered method or system is used.

(8) Each direct discharger shall develop and implement a maintenance schedule and a calibration schedule for each flow measurement system installed at that discharger's plant and shall maintain each flow measurement system according to good operating practices.

(9) Each direct discharger shall use reasonable efforts to set up flow measurement systems that can be inspected by a provincial officer.

Calculations of Effluent Volumes

23.-(1) Each direct discharger shall calculate, in cubic metres, a daily process effluent plant volume for each day.

(2) For the purposes of subsection (1), a process effluent plant volume for a day is the sum of the daily volumes calculated under section 22 in respect of the day.

(3) Each direct discharger shall calculate, in cubic metres, a monthly average process effluent plant volume for each month, by taking the arithmetic mean of the daily process effluent plant volumes calculated under subsection (1) for the month.

(4) Each direct discharger shall calculate, in cubic metres, a daily cooling water effluent plant volume for each day.

(5) For the purposes of subsection (4), a cooling water effluent plant volume for a day is the sum of the daily volumes calculated under section 22 in respect of the day.

(6) Each direct discharger shall calculate, in cubic metres, a monthly average cooling water effluent plant volume for each month, by taking the arithmetic mean of the daily cooling water effluent plant volumes calculated under subsection (4) for the month.

Storm Water Control Study

24.-(1) Each direct discharger shall complete a storm water control study in accordance with the requirements of the Ministry publication entitled "Storm Water Control Study Protocol", dated August, 1992.

(2) Where a direct discharger meets the exemption criteria set out in the Ministry publication entitled "Storm Water Control Study Protocol," dated August, 1992, the discharger shall so notify the Director in writing, no later than one year after this Regulation comes into force, and is then exempted from the requirement of subsection (1).

(3) A direct discharger shall complete the storm water control study required by subsection (1) no later than two years after this Regulation comes into force.

(4) Where, in order to meet the requirements of section 3 or 4 of this regulation, a direct discharger plans to make process changes, install waste water treatment facilities, implement management practices, or make any other changes at the discharger's plant that will alter the quantity or quality of storm water discharged from the plant, a discharger may delay the completion of the storm water control study as required under subsection (3) and shall notify the Director accordingly, in writing, no later than two years after this Regulation comes into force.

(5) A direct discharger that notifies the Director under subsection (4) shall complete the storm water control study required by subsection (1) no later than one year after sections 3 and 4 of this regulation come into force.

Record Keeping

25.-(1) Each direct discharger shall keep the records required to be kept under subsections (4) to (7) in an electronic format acceptable to the Director, and shall, from time to time, make these records available in an electronic format to the Ministry during normal working hours.

(2) Each direct discharger shall keep records of the locations of all sampling points established in accordance with the requirements of section 6.

(3) Each direct discharger shall keep records of all sampling and analytical procedures used in meeting the requirements of section 5, including, for each sample, the date, the time of collection, the sampling procedures used, and any incidents likely to affect the analytical results.

(4) Each direct discharger shall keep records of all the results of monitoring for limits, quality control, and assessment performed in accordance with the requirements of sections 11 through 15 and 21.

(5) Each direct discharger shall keep records of pH measurements performed in accordance with the requirements of section 16.

(6) Each direct discharger shall keep records of all the results of monitoring for acute lethality and chronic toxicity performed in accordance with the requirements of sections 17 through 20.

(7) Each direct discharger shall keep records of all flow measurements and all maintenance and calibration procedures carried out on each flow measurement system required to be performed under section 22.

(8) Each direct discharger shall keep records of all problems or malfunctions related to sampling, chemical analysis, on-line analyzers for Ph measurement, acute lethality and chronic toxicity testing, or flow measurement systems, or, other problems that interfere with fulfilling the requirements of this Regulation, detailing the date, duration and cause of each malfunction, and including a description of any remedial action taken.

(9) Each direct discharger shall keep records of any discharge of process effluent that is not discharged through a process effluent monitoring stream at the discharger's plant, in contravention of section 3 of this regulation, detailing the date, duration, cause and nature of each discharge.

(10) Each direct discharger shall keep records of all process changes and any redirection of effluent streams that affect the

quality of any process effluent monitoring stream or cooling water effluent monitoring stream at the discharger's plant.

(11) Each direct discharger shall keep records of the daily production for the products listed in schedule 4 for the discharger's plant.

(12) Each direct discharger shall keep all records required by this Regulation for a period of three years.

(13) Each direct discharger shall from time to time upon request, make records required to be kept under this section accessible to the Ministry during normal working hours.

Reporting

26.-(1) Each direct discharger shall notify the Director in writing of any change of name or ownership of the discharger's plant occurring after the day this Regulation comes into force, within thirty days after the end of the month in which the change occurs.

(2) Each direct discharger shall, within 30 days, notify the Director in writing of all process changes and any redirection of or change in the character of any effluent stream that permanently affects the quality of any effluent stream at the discharger's plant.

(3) Where an operating day of a direct discharger spans two calendar days, the discharger shall report the date of all sampling and flow measurements done on that operating day as the first of the two calendar days.

(4) On or before the first day of June each year, each direct discharger shall prepare a report including instances of non-compliance and summarizing the results of all testing performed by the discharger during the previous calendar year in accordance with the requirements of monitoring under sections 11 through 21 and measurement of flow under section 22, and shall make this report available at the discharger's plant during reasonable hours for inspection by the public.

(5) A direct discharger shall notify the Director in writing, within thirty days, if the discharger's plant has operated for more than ninety consecutive days, at less than seventy-five percent of the reference production rate specified in Schedule 4 for the discharger's plant.

Reporting - Compliance

(6) A direct discharger shall notify the Director, during normal business hours and as soon as the results are available, if for any parameter, a daily plant loading exceeds the limit specified in column 3 of schedule 2 or, a monthly average plant loading exceeds the limit specified in column 4 of schedule 2.

(7) Where an on-line analyzer is used for the purposes of measuring pH under section 16, a direct discharger shall notify the Director, during normal business hours and as soon as the results are available, if the discharger fails to meet the pH requirements of section 3 for any period of more than fifteen consecutive minutes throughout an operating day, and shall notify the Director of the duration of the failure.

(8) Despite subsection (7), a direct discharger need not notify the Director if the failure to meet the pH requirements of section 3 is the result of a problem or malfunction related to the on-line analyzer or, the maintenance or calibration of the on-line analyzer.

(9) Where an alternate method is used for the purposes of measuring pH under section 16, a direct discharger shall notify the Director, during normal business hours, as soon as the results are available, if the discharger fails to meet the pH requirements of section 3.

(10) A direct discharger shall notify the Director as soon as the results are available, during normal business hours, if the discharger fails to meet the lethality limits of section 4.

Quarterly Reporting

(11) Once in each quarter, each direct discharger shall report to the Director, in a format acceptable to the Director, all information required to be reported under subsections (12) through (19) in an electronic format, and by hard copy generated from that electronic format signed by the direct discharger, no later than forty-five days after the end of the quarter to which the information relates.

Loadings

(12) For process effluent monitoring streams, each direct discharger shall report for each month, the monthly average plant loadings and the maximum and minimum daily plant loadings for each of the parameters for which there is a limit set out in columns 3 of schedule 2 for the discharger's plant,

(13) For process effluent monitoring streams, a direct discharger shall report, for any parameter, any daily plant loading that exceeded the limit specified in column 3 of schedule 2 and any monthly average plant loading that exceeded the limit specified in column 4 of schedule 2, during any month.

(14) For cooling water effluent monitoring streams, each direct discharger shall report for each month, the monthly average plant loadings and the maximum and minimum daily plant loadings for each of the parameters set out in schedule 3 for the discharger's plant.

pH

(15) Each direct discharger shall report an estimation of an average pH range for each process effluent monitoring stream at the discharger's plant, for each month during the quarter.

Flow Measurement

(16) For process effluent monitoring streams, each direct discharger shall report the monthly average plant volume, and the maximum and minimum daily plant volumes for each month.

(17) For cooling water effluent monitoring streams, each direct discharger shall report the monthly average plant volume, and the maximum and minimum daily plant volumes for each month.

(18) Each direct discharger shall report the number of days throughout each month on which effluent was discharged from each process effluent monitoring stream.

(19) Each direct discharger shall report the number of days throughout each month on which effluent was discharged from each cooling water effluent monitoring stream.

Reporting - By-Passes

(20) Each direct discharger shall report to the Director, as soon as is reasonably possible, any process effluent that is discharged other than through a process effluent monitoring stream at the discharger's plant, detailing the time, duration, cause and nature of each discharge.

Reporting - Chronic Toxicity Testing

(21) Each direct discharger shall report to the Director in writing, the results of all chronic toxicity testing performed under sections 19 and 20, together with the date on which each sample was collected, no later than sixty days after the end of each semi-annual period in which the tests were performed.

Reporting - AOX Elimination Plan (AEP)

(22) Each direct discharger for which a limit for AOX is listed in column 3 of schedule 2 for that discharger's plant shall, no later than 6 months after this regulation comes into force, submit to the Director an initial or preliminary plan which contains a preliminary schedule and outlines methods by which AOX generated from the bleaching of wood fibre or recycled fibre at the discharger's plant may be eliminated by the year 2002.

(23) Each direct discharger for which a limit for AOX is listed in column 3 of schedule 2 for that discharger's plant shall, on or before December 31, 1995, submit to the Director an interim, "AOX Elimination Plan," prepared in accordance with the Part 1 requirements of schedule 5 of this regulation, which describes the methods by which AOX generated from the bleaching of wood fibre or recycled fibre at the discharger's plant may be eliminated by the year 2002.

(24) Each direct discharger for which a limit for AOX is listed in column 3 of schedule 2 for that discharger's plant shall, on or before December 31, 1998, submit to the Director a final "AOX Elimination Plan," prepared in accordance with the Part 1 requirements of schedule 5 of this regulation, which describes the methods by which the discharger proposes to eliminate, by the year 2002, AOX generated from the bleaching of wood fibre or recycled fibre at the discharger's plant.

(25) Each direct discharger for which a limit for AOX is listed in column 3 of schedule 2 for that discharger's plant, shall submit to the Director no later than the thirty-first day of December of the year in which it is due, an annual status report and AEP update prepared in accordance with the requirements of part 2 of schedule 5.

Timing

27.-(1) Sections 1, 2, 5, 6, 24 and subsection 3(5) and 26(22) of this Regulation come into force on the day it is filed.

(2) Sections 7 through 23 and 25, and subsections 26(1) through (5) and 26(11) through (22), come into force ninety days after this Regulation is filed.

(3) Subsections 3(1) through (4) and (6), sections 4, 7a, 7b and subsections 26(6) through (10), (23) and (25), come into force on December 31, 1995.

(4) Subsection 26(24) comes into force on December 31, 1998.

(5) Subsection 3(7) comes into force on December 31, 1999.

LIST OF SCHEDULES

LIST OF PROTOCOLS

SCHEDULE 1: LIST OF REGULATED PLANTS

CATEGORY	PLANT NAME	LOCATION	OWNER AS OF JUNE 15, 1989
Sulphate (Kraft)	Boise Cascade	Fort Frances	Boise Cascade Canada Ltd.
	Canadian Pacific Forest Products	Dryden	Canadian Pacific Forest Products Ltd.
	Canadian Pacific Forest Products	Thunder Bay	Canadian Pacific Forest Products Ltd.
	Domtar	Cornwall	Domtar Inc., Fine Papers Division
	Domtar	Red Rock	Domtar Inc., Containerboard Division
	Eddy Forest Products	Espanola	E.B. Eddy Forest Products Ltd.
	James River	Marathon	James River–Marathon Ltd.
	Kimberly–Clark	Terrace Bay	Kimberly Clark of Canada Ltd.
	Malette	Smooth Rock Falls	Malette Inc., Malette Kraft Pulp and Power Division
Sulphite–Mechanical	Abitibi–Price Fort William Mill	Thunder Bay	Abitibi–Price Inc., Fort William Division
	Abitibi–Price Port Arthur Mill	Thunder Bay	Abitibi–Price Inc., Provincial Papers Division
	Abitibi–Price	Iroquois Falls	Abitibi–Price Inc., Iroquois Falls Division
	Boise Cascade	Kenora	Boise Cascade Canada Ltd.
	Quebec & Ontario Paper	Thorold	Q & O Paper Company Ltd.
	St. Marys Paper	Sault Ste. Marie	St. Marys Paper Inc.
	Spruce Falls	Kapuskasing	Spruce Falls Power and Paper Company Ltd.
Corrugating	Domtar	Trenton	Domtar Inc., Containerboard Division
	MacMillan–Bloedel	Sturgeon Falls	MacMillan–Bloedel Ltd.
Deinking/ Board/ Fine Papers/ Tissue	Beaver Wood Fibre	Thorold	Beaver Wood Fibre Company Ltd.
	Domtar Fine Papers	St. Catharines	Domtar Inc., Fine Paper Division
	Eddy Forest Products	Ottawa	E.B. Eddy Forest Products Ltd.
	Fraser	Thorold	Noranda Forest Inc.
	Kimberly–Clark	Huntsville	Kimberly Clark of Canada Ltd.
	Kimberly–Clark	St. Catharines	Kimberly Clark of Canada Ltd.
	Sonoco Limited	Trenton	Paperboard Industries Corporation
	Strathcona	Napanee	Roman Corporation Ltd.

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Abitibi–Price Inc. Fort William Division		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	60.8	36.9
8	Total Suspended Solids (TSS)	D	4240 *	2500 *
16	Chloroform	W	1.59	0.805
17	Toluene	W	0.0920	0.0920
20	Phenol	W	0.177	0.177
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	4280	2140

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Abitibi–Price Inc. Iroquois Falls Division		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	129	78.2
8	Total Suspended Solids (TSS)	D	12100	7130
16	Chloroform	W	3.37	1.70
17	Toluene	W	0.195	0.195
20	Phenol	W	0.374	0.374
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	9060	4530

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Abitibi–Price Inc. Provincial Papers Division		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	69.4	42.2
8	Total Suspended Solids (TSS)	D	4240 *	2500 *
16	Chloroform	W	1.82	0.919
17	Toluene	W	0.105	0.105
20	Phenol	W	0.202	0.202
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	4890	2450

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Beaver Wood Fibre Company Ltd.		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	28.6	17.4
8	Total Suspended Solids (TSS)	D	1530 *	904 *
16	Chloroform	W	0.753	0.378
17	Toluene	W	0.0746	0.0746
20	Phenol	W	0.0833	0.0833
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	2030	1010

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Boise Cascade Canada Ltd. (Fort Frances)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	155	94.4
8	Total Suspended Solids (TSS)	D	14700	8610
16	Chloroform	W	4.07	2.06
17	Toluene	W	0.235	0.235
20	Phenol	W	0.452	0.452
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	10900	5470
M13	Adsorbable Organic Halide – Day One	W	1890	1470
	– December 31, 1995	W	1130	881
	– December 31, 1999	W	605	470

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Boise Cascade Canada Ltd. (Kenora)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	150	91.2
8	Total Suspended Solids (TSS)	D	7640 *	4500 *
16	Chloroform	W	3.93	1.99
17	Toluene	W	0.227	0.227
20	Phenol	W	0.437	0.437
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	10600	5290

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Canadian Pacific Forest Products (Dryden)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	179	109
8	Total Suspended Solids (TSS)	D	12000 *	7500 *
16	Chloroform	W	4.68	2.37
17	Toluene	W	0.270	0.270
20	Phenol	W	0.520	0.520
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	9000 *	5000 *
M13	Adsorbable Organic Halide – Day One	W	2950	2290
	– December 31, 1995	W	1770	1370
	– December 31, 1999	W	942	732

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Canadian Pacific Forest Products (Thunder Bay)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	367	223
8	Total Suspended Solids (TSS)	D	25000 *	15000 *
16	Chloroform	W	9.61	4.86
17	Toluene	W	0.556	0.556
20	Phenol	W	1.07	1.07
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	25800	12900
M13	Adsorbable Organic Halide – Day One	W	4960	3850
	– December 31, 1995	W	2970	2310
	– December 31, 1999	W	1590	1230

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Domtar Inc., Containerboard Division (Red Rock)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	139	84.2
8	Total Suspended Solids (TSS)	D	10000 *	6300 *
16	Chloroform	W	3.63	1.83
17	Toluene	W	0.210	0.210
20	Phenol	W	0.403	0.403
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	9760	4880
M13	Adsorbable Organic Halide – Day One	W	242	188
	– December 31, 1995	W	145	113
	– December 31, 1999	W	77.3	60.0

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Domtar Inc., Containerboard Division (Trenton)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	31.5	19.2
8	Total Suspended Solids (TSS)	D	2960	1750
16	Chloroform	W	0.829	0.416
17	Toluene	W	0.0821	0.0821
20	Phenol	W	0.0917	0.0917
24	2,3,7,8−T4CDD	Q	NM	NM
	2,3,7,8−T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	2230	1110

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non−Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Domtar Inc., Fine Papers Division (Cornwall)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	122	73.9
8	Total Suspended Solids (TSS)	D	11500	6740
16	Chloroform	W	3.18	1.61
17	Toluene	W	0.184	0.184
20	Phenol	W	0.354	0.354
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	8560	4280
M13	Adsorbable Organic Halide – Day One	W	1550	1200
	– December 31, 1995	W	926	720
	– December 31, 1999	W	494	384

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Domtar Inc., Fine Papers Division (St. Catharines)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	16.2	9.84
8	Total Suspended Solids (TSS)	D	1520	896
16	Chloroform	W	0.425	0.214
17	Toluene	W	0.0421	0.0421
20	Phenol	W	0.0470	0.0470
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	1140	570

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: E.B. Eddy Forest Products Ltd. (Espanola)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	173	105
8	Total Suspended Solids (TSS)	D	12900 *	7500 *
16	Chloroform	W	4.52	2.29
17	Toluene	W	0.261	0.261
20	Phenol	W	0.502	0.502
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	10400 *	6000 *
M13	Adsorbable Organic Halide – Day One	W	3920	3040
	– December 31, 1995	W	2350	1820
	– December 31, 1999	W	1250	973

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: E.B. Eddy Forest Products Ltd. (Ottawa)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	19.3	11.7
8	Total Suspended Solids (TSS)	D	1820	1070
16	Chloroform	W	0.508	0.255
17	Toluene	W	0.0503	0.0503
20	Phenol	W	0.0562	0.0562
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	1370	681

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: James River–Marathon Ltd.		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	74.3	45.1
8	Total Suspended Solids (TSS)	D	5400 *	3300 *
16	Chloroform	W	1.95	0.983
17	Toluene	W	0.112	0.112
20	Phenol	W	0.216	0.216
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	5230	2620
M13	Adsorbable Organic Halide – Day One	W	1680	1310
	– December 31, 1995	W	1010	785
	– December 31, 1999	W	539	418

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Kimberly–Clark Canada Inc. (Huntsville)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	0.300 *	0.183 *
8	Total Suspended Solids (TSS)	D	151 *	88.9 *
16	Chloroform	W	0.256	0.129
17	Toluene	W	0.0254	0.0254
20	Phenol	W	0.0283	0.0283
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	227 *	113 *

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Kimberly-Clark Canada Inc. (St. Catharines)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	9.41	5.72
8	Total Suspended Solids (TSS)	D	885	521
16	Chloroform	W	0.247	0.124
17	Toluene	W	0.0245	0.0245
20	Phenol	W	0.0274	0.0274
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	666	332

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Kimberly–Clark Canada Inc. (Terrace Bay)		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	186	113
8	Total Suspended Solids (TSS)	D	11500 *	7000 *
16	Chloroform	W	4.87	2.46
17	Toluene	W	0.281	0.281
20	Phenol	W	0.540	0.540
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	13100	6540
M13	Adsorbable Organic Halide – Day One	W	4210	3270
	– December 31, 1995	W	2520	1960
	– December 31, 1999	W	1350	1050

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: MacMillan–Bloedel Ltd.		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	24.8	15.1
8	Total Suspended Solids (TSS)	D	2340	1380
16	Chloroform	W	0.653	0.328
17	Toluene	W	0.0647	0.0647
20	Phenol	W	0.0722	0.0722
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	1760	876

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Malette Kraft Pulp and Power Company		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	55.4	33.7
8	Total Suspended Solids (TSS)	D	5200 *	3070
16	Chloroform	W	1.45	0.733
17	Toluene	W	0.0839	0.0839
20	Phenol	W	0.161	0.161
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	3900	1950
M13	Adsorbable Organic Halide – Day One	W	1260	975
	– December 31, 1995	W	753	585
	– December 31, 1999	W	402	312

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Quebec & Ontario Paper Company Ltd.		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	143	86.6
8	Total Suspended Solids (TSS)	D	11500 *	6800 *
16	Chloroform	W	3.73	1.89
17	Toluene	W	0.216	0.216
20	Phenol	W	0.415	0.415
24	2,3,7,8-T4CDD	Q	NM	NM
	2,3,7,8-T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	10000	5020

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non-Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Noranda Forest Products Inc. Recycled Papers		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	23.4	14.3
8	Total Suspended Solids (TSS)	D	2200	1300
16	Chloroform	W	0.616	0.310
17	Toluene	W	0.0611	0.0611
20	Phenol	W	0.0682	0.0682
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	2840	1420
M13	Adsorbable Organic Halide – Day One	W	914	710
	– December 31, 1995	W	548	426
	– December 31, 1999	W	293	227

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: St. Marys Paper Inc.		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	89.3	54.3
8	Total Suspended Solids (TSS)	D	8430	4950
16	Chloroform	W	2.34	1.18
17	Toluene	W	0.135	0.135
20	Phenol	W	0.260	0.260
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	6290	3150

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Sonoco Limited		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	28.2	17.2
8	Total Suspended Solids (TSS)	D	2650	1560
16	Chloroform	W	0.742	0.373
17	Toluene	W	0.0735	0.0735
20	Phenol	W	0.0821	0.0821
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	2000	995

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Strathcona Paper Company		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	17.9	10.9
8	Total Suspended Solids (TSS)	D	1680	992
16	Chloroform	W	0.471	0.237
17	Toluene	W	0.0467	0.0467
20	Phenol	W	0.0521	0.0521
24	2,3,7,8–T4CDD	Q	NM	NM
	2,3,7,8–T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	204 *	102 *

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non–Measurable

* Based on more stringent existing Ministry Control Order or Certificate of Approval Requirements

SCHEDULE 2: PROCESS EFFLUENT LIMITS

PLANT: Spruce Falls Power and Paper Company Ltd		LIMITS		
ANALYTICAL TEST GROUP		Monitoring Frequency	Daily Loading	Monthly Average Loading
No.	Parameter		kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
6	Total Phosphorus	W	156	94.6
8	Total Suspended Solids (TSS)	D	14700	8630
16	Chloroform	W	4.08	2.06
17	Toluene	W	0.236	0.236
20	Phenol	W	0.453	0.453
24	2,3,7,8−T4CDD	Q	NM	NM
	2,3,7,8−T4CDF	Q	NM	NM
M8	Biochemical Oxygen Demand (5 day)	D	11000	5480

Explanatory Notes:
D = Daily Monitoring Requirement
W = Weekly Monitoring Requirement
Q = Quarterly Monitoring Requirement

No. = Analytical Test Group (ATG) Number
kg/day = kilograms per day
NM = Non−Measurable

SCHEDULE 2A
Unit of Production Loading Limits for the Sulphate (Kraft) Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Daily Limit
BOD, 5 day	10.0	5.00
Total Suspended Solids	13.4	7.87
AOX - Day One - December 31, 1995 - December 31, 1999	3.22 1.93 1.03	2.50 1.50 0.800
Total Phosphorus	0.142	0.0863
Chloroform	0.00372	0.00188
Toluene	0.000215	0.000215
Phenol	0.000413	0.000413
2,3,7,8-TCDD	Non-measurable	Non-measurable
2,3,7,8-TCDF	Non-measurable	Non-measurable
Toxicity	Non-Acutely Lethal	

SCHEDULE 2A
Unit of Production Loading Limits for the Sulphite-Mechanical Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Daily Limit
BOD, 5 day	10.0	5.00
Total Suspended Solids	13.4	7.87
Total Phosphorus	0.142	0.0863
Chloroform	0.00372	0.00188
Toluene	0.000215	0.000215
Phenol	0.000413	0.000413
2,3,7,8-TCDD	Non-measurable	Non-measurable
2,3,7,8-TCDF	Non-measurable	Non-measurable
Toxicity	Non-Acutely Lethal	

SCHEDULE 2A

Unit of Production Loading Limits for the Corrugating Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Daily Limit
BOD, 5 day	5.84	2.91
Total Suspended Solids	7.76	4.57
Total Phosphorus	0.0825	0.0502
Chloroform	0.00217	0.00109
Toluene	0.000215	0.000215
Phenol	0.000240	0.000240
2,3,7,8-TCDD	Non-measurable	Non-measurable
2,3,7,8-TCDF	Non-measurable	Non-measurable
Toxicity	Non-Acutely Lethal	

SCHEDULE 2A

Unit of Production Loading Limits for the Deinking/Board/Fine Papers/Tissue Category (kg/tonne)

Parameter	Daily Limit	Monthly Average Daily Limit
BOD, 5 day BOD, 5 day (Noranda Forest Inc. only)	5.84 10.0	2.91 5.00
Total Suspended Solids	7.76	4.57
Total Phosphorus	0.0825	0.0502
Chloroform	0.00217	0.00109
Toluene	0.000215	0.000215
Phenol	0.000240	0.000240
2,3,7,8-TCDD	Non-measurable	Non-measurable
2,3,7,8-TCDF	Non-measurable	Non-measurable
Toxicity	Non-Acutely Lethal	

SCHEDULE 3: ASSESSMENT MONITORING REQUIREMENTS
ONCE–THROUGH COOLING WATER, WEEKLY MONITORING

PLANT: All Plants	
ANALYTICAL TEST GROUP	
Number	Parameter
1	Chemical Oxygen Demand (COD)
3	Hydrogen ion (pH)
5a	Dissolved Organic Carbon (DOC)
7	Specific Conductance
8	Total Suspended Solids

SCHEDULE 4: REFERENCE PRODUCTION RATES

PLANT NAME	REFERENCE PRODUCTION RATE	
	Bleached Kraft tonne/day	Finished Product tonne/day
Abitibi–Price Inc., Fort William Division		428
Abitibi–Price Inc., Iroquois Falls Division		906
Abitibi–Price Inc., Provincial Papers Division		489
Beaver Wood Fibre Company Ltd.		347
Boise Cascade Canada Ltd. (Fort Frances)	587	1094
Boise Cascade Canada Ltd. (Kenora)		1057
Canadian Pacific Forest Products (Dryden)	915	1258
Canadian Pacific Forest Products (Thunder Bay)	1540	2584
Domtar Inc., Containerboard Division (Red Rock)	75	976
Domtar Inc., Containerboard Division (Trenton)		382
Domtar Inc., Fine Papers Division (Cornwall)	480	856
Domtar Inc., Fine Papers Division (St. Catharines)		196
E.B. Eddy Forest Products Ltd. (Espanola)	1216	1216
E.B. Eddy Forest Products Ltd. (Ottawa)		234
James River–Marathon Ltd.	523	523
Kimberly–Clark Canada Inc. (Huntsville)		118
Kimberly–Clark Canada Inc. (St. Catharines)		114
Kimberly–Clark Canada Inc. (Terrace Bay)	1308	1308
MacMillan–Bloedel Ltd.		301
Malette Kraft Pulp and Power Company	390	390
Noranda Forest Inc., Recycled Papers		284
Quebec & Ontario Paper Company Ltd.		1004
St. Marys Paper Inc.		629
Sonoco Limited		342
Spruce Falls Power and Paper Company Ltd.		1096
Strathcona Paper Company		217

SCHEDULE 5

REQUIREMENTS for AOX Elimination Plans

(AEP's)

This schedule applies to all direct dischargers which are required under Section 26 of this regulation to submit an AEP.

Written AEP's which are submitted under this regulation will be evaluated by the Ministry in the context of environmental, technological and economic factors.

Commencing in 1999, each direct discharger shall prepare and submit a status report and AEP update annually.

Part 1

AEP Contents

In order to comply with the AEP requirement of section 26 of this regulation, each direct discharger shall submit information that:

a) Describes the AOX elimination policy for the discharger's plant, along with a plan for communicating this policy to relevant employee and management personnel. This description should include: specific short-term and long-term goals for AOX elimination; a statement of top-level management commitment to the elimination policy; methods used to accomplish top-level management support (i.e., reward and recognition program); and designation of a AEP team responsible for implementing the AEP.

b) Identifies the annual amounts of chlorine and chlorine compounds used for bleaching at the discharger's plant during the previous calendar year.

c) Describes (narratively) the sources of generation of AOX from the bleaching operations and contains a simple flow diagram or block diagram of the unit(s), processes or operations generating the AOX to facilitate evaluation of the chlorine and chlorine elimination efforts. The diagram must include, as a minimum, major process steps, equipment and AOX waste streams.

d) Provides detailed descriptions of AEP options that apply to the discharger's plant including, but not necessarily limited to, options which consider:

i) substitution of other chemical agents for the bleaching of wood fibre or recycled fibre;

ii) reformulation of products which will eliminate the need for the use of chlorine or chlorine compounds;

e) Provides an evaluation of the technical feasibility of implementing the AEP options listed in item d);

f) Provides a proposed schedule for implementing the preferred option(s) from those listed in item d).

g) Provides an estimate of the anticipated reductions in AOX that will result from the various stages of a staged AEP.

Part 2

Annual Report and Update of the AEP

In preparing an annual report/update, each direct discharger shall:

a) Include the amount of AOX generated by the discharger's plant (prior to biological treatment) for the year and the method by which the amount of AOX generated was determined.

b) Include any re-evaluations of the technical feasibility of the preferred option(s) submitted in the AEP and evaluations of the technical feasibility and cost of any new options that were considered since the last update of the AEP;

c) Include any changes in the discharger's priorities, resource requirements, monitoring program and schedules associated with the AEP.

The reports must be submitted no later than the thirty-first day of December of the year in which they are due and must provide continuity with previous reports.

THE TWELVE MONTH REPORT

APPENDIX II

OF THE

DEVELOPMENT DOCUMENT

TABLE OF CONTENTS

LIST OF TABLES

1.0 INTRODUCTION

The Effluent Monitoring Regulation for the Pulp and Paper Sector[1] was promulgated on July 21, 1989. Under the effluent monitoring regulation, direct discharge pulp and paper mills were required to monitor their effluent for a one year period starting on January 1, 1990. The effluent monitoring regulation was designed to produce a comprehensive database on pulp and paper mill effluent quality that could be used in the development of effluent limits.

The effluent monitoring regulation required direct discharge mills to monitor their process effluent, cooling water effluent, storm water effluent, backwash effluent, emergency overflow effluent and waste disposal site effluent for up to 135 parameters on a daily, thrice weekly, weekly, monthly, bi-monthly or semi-annual basis.

The Development Document for the Effluent Monitoring Regulation for the Pulp and Paper Sector[2] explains the rationale behind the selection of the parameters to be monitored and the frequency of monitoring.

The results of the one year effluent monitoring period have been published in two 'preliminary' reports. The first report, the "Preliminary Report on the First Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (January 1, 1990 to June 30, 1990)"[3], was published in February, 1991. The second report, the "Preliminary Report on the Second Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (July 1, 1990 to December 31, 1990)"[4], was published in September, 1991. Both reports presented 'preliminary' data that had not been subject to quality assurance/quality control (QA/QC) data assessment.

This report presents the effluent monitoring data for the pulp and paper sector following the selection of the candidate parameters for effluent limits setting and following the quality assurance/quality control data assessment.

2.0 QUANTITY OF ANALYTICAL DATA

In total, 191,932 pieces of data were collected under the effluent monitoring regulation including 46,646 pieces of quality assurance/quality control data. The data provided in this report reflect the Ministry database as of May 31, 1991.

Table 1.0 presents the number of sampling points monitored and the number of data points collected under the effluent monitoring regulation. Over 65% of the data points are for process effluent while 24% of the data points are for quality assurance/quality control data.

Table 1.0
Number of Sampling and Data Points

Effluent or Sample Type	Number of Sampling Points	Number of Data Points
Process	29	25,408
Cooling Water	14	4,565
Backwash	3	196
Storm Water	46	2,897
Waste Disposal Site	1	578
Emergency Overflow	9	1,474
Intake (not required by the regulation)	9	10,168
Quality Assurance/Quality Control Data	n/a	46,646
Total	111	191,932

Legend
N/A = not applicable

3.0 MONITORING DATA ANALYSIS

In order to confirm the integrity of the effluent monitoring data, it was necessary to conduct a rigorous data validation exercise. Data validation involved the following steps:

Units Verification

The data were reviewed to ensure that the correct units were reported for each parameter for the entire monitoring period. Where the use of incorrect units was identified, direct dischargers were required to resubmit the data with the correct units. The use of data with incorrect units could cause large errors in the parameter loading calculations.

Multiple Record Identification

The data were reviewed to determine whether two or more test results existed for the same sample. When multiple records were found, the incorrect records were identified and removed from the database. The presence of incorrect records could adversely affect the parameter loading calculations.

Sample Type Code Verification

Sample type codes were reviewed in order to ensure that the appropriate sampling procedures were used to collect samples for the analysis of sulphides and halogenated and non-halogenated volatiles. In some cases incorrect sample type codes were reported although the sample had been collected using the correct sampling procedure. All erroneous sample type codes were corrected.

Remark Code Verification

Remark codes were used to highlight problems or uncertainty with the reported data. Remark code usage was checked to ensure that the data were correctly identified and labelled. Table 3.3 lists the remark codes that were used during the effluent monitoring period and briefly describes each code.

Table 3.3
Remark Codes

Remark Code	Description
<	Actual amount less than reported
>	Actual amount probably greater than reported
A	Approximate value
<DL	Reported value = MDL: measured amount MDL (non-zero)
<T	A measurable trace amount: interpret with caution
<W	No measurable response (zero): reported value
<WE	No measurable response (dilution/concentration): reported value
AR	Attached report
I	Interference suspected
IC	Interference: Colour
IM	Interference: Sample Matrix
N/A	No data will be reported: see textual report
OLD	Old: sample exceeds maximum storage time
UQC	Data unreliable: possible lab QC problem(s)
UCR	Data unreliable: could not confirm by reanalysis
!IN	No data: insufficient volume due to inspection
!NM	No effluent: no sample available
?	Late data: data not yet available

All analytical results with remark codes ">", "A", "<DL", "<T" and "<W", and analytical results without a remark code were included in the effluent monitoring data analysis. All data with remark codes different than the ones mentioned above were excluded because the results were questionable (approximately 4.5 % of the database).

Data with analytical results below the regulation method detection limit (RMDL) were used as reported unless the value was less than or equal to the RMDL/10 in which case, the value of the RMDL/10 was used.

Attached Report Investigation

All of the effluent monitoring data with the attached report, "AR", remark code were investigated during the data validation exercise. Attached reports were submitted by the discharger to explain any sampling and analytical problems encountered during the monitoring period.

Since only 0.2% of the database contained records with the "AR" remark code, it was decided that for parameters sampled at relatively high frequencies, these data would not be considered during subsequent data analysis.

For parameters sampled at relatively low frequencies, data with the "AR" remark code were further investigated and data submissions were requested as necessary.

Outlier Investigation

Statistical outliers or extreme values were identified according to the general procedures outlined in the Issue Resolution Committee Report on Monitoring Data Analysis[5]. Outlier values were examined to ensure that all data points were correctly reported and that the outlier values were not the result of data entry error. Direct discharges with outlier values due to data entry error were required to resubmit the correct values.

4.0 CANDIDATE PARAMETER SELECTION

Following data collection and validation, the selection criteria identified in the Issue Resolution Committee report on Selection of Parameters for Limits were used to identify candidate parameters for effluent limits setting. A parameter was selected for effluent limits setting if the effluent monitoring data for any process effluent showed, at a 95% confidence level, that 10% or more of the data for that parameter and for that effluent, were at concentrations greater than or equal to the parameter's regulation method detection limit.

A total of 77 parameters were selected as candidate parameters for effluent limits setting for the sulphate (kraft) category, 43 for the sulphite/mechanical category, 38 for the corrugating category and 49 for the deinking/board/fine papers/tissue category. The parameter pH was not included in candidate parameter selection because it will be regulated separately under the effluent limits regulation.

5.0 QUALITY ASSURANCE/QUALITY CONTROL DATA ASSESSMENT

Following candidate parameter selection, the quality assurance/quality control (QA/QC) data were examined in order to determine whether the effluent monitoring data for the parameters selected for effluent limits setting were of reliable quality and were acceptable for use in the development of effluent limits.

The QA/QC data assessment involved the retrieval and screening of the field QA/QC data and corresponding process effluent monitoring data for each mill. The data were sorted and summarized and evaluated according to the procedures outlined in the Issue Resolution Committee report on Quality Assurance and Quality Control[6]. Data were graded in terms of whether they were of reliable quality, limited quality or unreliable quality. A parameter was removed from further consideration in the effluent limits setting process if the QA/QC data assessment indicated that its presence in mill effluent was highly suspect or if all of the data for the parameter were of limited quality or unreliable quality.

Full details of the QA/QC data assessment are presented in the Report on the Analysis of the Quality Assurance and Quality Control Data for the MISA Pulp and Paper Sector[7].

6.0 MONITORING DATA RESULTS

Tables 1.1 to 1.5 present the average daily loadings of the parameters that were monitored daily, thrice-weekly and weekly for each mill and for category of mill during the effluent monitoring period. Daily loading results were calculated as the product of the daily flow and daily concentration values for each parameter. For the two mills with more than one process effluent stream, Abitibi-Price (Fort William) and MacMillan-Bloedel Ltd, daily loading results were calculated as the sum of the daily loading results for each effluent stream.

Tables 2.1 to 2.27 list, for each mill and for each process effluent, the total number of analyses, frequency of detection above the RMDL and long-term average concentrations of the candidate parameters selected for effluent limits setting. The tables also present the conclusions of the QA/QC data assessment for each parameter.

Table 3.1 lists the average process effluent flowrates for each mill and for the sector as a whole over the effluent monitoring period.

Tables 4.1 to 4.14 present summaries of the cooling water effluent monitoring data for those mills with cooling water effluent streams.

Tables 5.1 to 5.9 present summaries of the emergency overflow effluent monitoring data for those mills with emergency overflow effluent streams.

Tables 6.1 to 6.3 present summaries of the backwash effluent monitoring data for those mills with backwash effluent streams.

Table 7.1 presents a summary of the waste disposal site effluent monitoring data for the one mill that has a waste disposal site effluent stream.

Tables 8.1 to 8.46 present summaries of the stormwater effluent monitoring data for those mills with stormwater effluent streams.

Tables 9.1 to 9.9 present summaries of the intake water effluent monitoring data for those mills with intake water effluent streams.

Table 10.1 presents a summary of the rainbow trout and Daphnia magna process effluent toxicity test results for each mill in the sector.

6.0 REFERENCES

1. Government of Ontario (1989). Ontario Regulation 435/89 as amended to Ontario Regulation 202/90 under the Environmental Protection Act -- Effluent Monitoring - Pulp and Paper Sector. Toronto, Ontario. May 1990.

2. Ontario Ministry of Environment (1989). The Development Document for the Pulp and Paper Sector. Toronto, Ontario.

3. Ontario Ministry of the Environment (1991). Preliminary Report on the First Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (January 1, 1990 to June 30, 1990). Toronto, Ontario. February 1991.

4. Ontario Ministry of the Environment (1991). Preliminary Report on the Second Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (July 1, 1990 to December 31, 1990). Toronto, Ontario. September 1991.

5. Ontario Ministry of the Environment (1990). MISA Issues Resolution Process - Issue Resolution Committee Reports. Toronto, Ontario. June 1990.

6. Ibid.

7. Ontario Ministry of the Environment (1992). Report on the Analysis of the Quality Assurance and Quality Control Data for the MISA Pulp and Paper Sector. Toronto, Ontario.

TABLE 1.1
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN MISA PULP AND PAPER SECTOR PROCESS EFFLUENTS

PARAMETER	Sulphate (Kraft) Category (9 mills) Total	Sulphite-Mechanical Category (8 mills) Total	Corrugating Category (2 mills) Total	Deinking/ Board/Fine Papers/Tissue Category (8 mills) Total	Sector Total
Adsorbable Organic Halide (AOX)	15,493	.	.	115	15,608
Aluminum	1,867	503	25	172	2,567
Ammonia plus Ammonium	678	133	132	11.8	954.8
BOD, 5 day, Total Demand	120,268	172,864	37,142	9,773	340,047
COD	508,068	191,185	12,009	17,504	728,766
DOC	11,725	91,612	32,394	2,755	138,533
Dehydroabietic Acid	553	951	7	36	1,547
Dichlorodehydroabietic Acid	43	.	.	.	43
Nitrate+Nitrite	1,110	68	6,796	19.5	7,993.5
Total Kjeldahl Nitrogen	2,894	1,034	533	184	4,645
Total phosphorus	604	182	58	9.2	853.2
Total suspended solids	57,971	31,960	3,247	3,894	97,072
Volatile suspended solids	20,195	2,309	1,857	956	25,317
Zinc	89	41	10	10.11	150.11

. = not monitored for this category

TABLE 1.2
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN SULPHATE (KRAFT) PROCESS EFFLUENT

PARAMETER	Mill									Total
	Boise (F)	CP (Dry.)	CP (T.Bay)	Domtar (C)	Domtar (RR)	Eddy (E)	James R.	KC (Terr.)	Malette	
Adsorbable Organic Halide	1,964	1,936	4,171	431	175	854	2,787	1,967	1,208	15,493
Aluminum	92	111	844	208	291	75	16	47	183	1,867
Ammonia plus Ammonium	8	78	106	61	41	109	153	85	37	678
BOD, 5 day, Total Demand	9,430	2,761	48,622	20,867	15,326	1,808	11,991	1,452	8,011	120,268
COD	60,456	47,624	172,179	60,335	41,041	.	46,622	48,291	31,520	508,068
DOC	.	.	.	.	.	11,725	.	.	.	11,725
Dehydroabietic Acid	32	6	312	59	110	2	3	1	28	553
Dichlorodehydroabietic Acid	12	6	11	2	2	*	3	1	6	43
Nitrate+Nitrite	12	770	*	32	13	15	211	37	20	1,110
Total Kjeldahl Nitrogen	752	177	263	430	179	378	181	432	102	2,894
Total phosphorus	147	117	116	44	23	56	36	45	20	604
Total suspended solids	10,987	5,011	15,335	9,750	6,026	2,592	2,654	3,866	1,750	57,971
Volatile suspended solids	10,201	4,671	.	.	.	1,739	.	3,584	.	20,195
Zinc	13	10	28	6	4	9	4	8	7	89

. = not monitored at this mill
* = not found more than 5% of the time at this mill.

TABLE 1.3
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN SULPHITE-MECHANICAL PROCESS EFFLUENT

PARAMETER	Mill								Total
	AP (Ft.W)	AP (I.Falls)	AP (PP)	AP (T.Bay)	Boise (K)	Q&O	St. Marys	Spruce F.	
Aluminum	14	188	86	55	17	43	78	22	503
Ammonia plus Ammonium	4	*	11	*	*	114	4	*	133
BOD, 5 day, Total Demand	13,277	50,054	4,265	28,280	33,132	1,385	6,849	35,622	172,864
COD	.	.	.	.	99,342	.	21,152	70,691	191,185
DOC	10,409	47,969	2,916	28,519	.	1,799	.	.	91,659
Dehydroabietic Acid	111	265	22	79	220	5	74	175	951
Nitrate+Nitrite	*	15	13	9	11	20	*	*	68
Total Kjeldahl Nitrogen	89	226	52	85	101	227	42	212	1,034
Total phosphorus	16	53	4	11	16	27	31	24	182
Total suspended solids	1,227	7,766	1,599	1,869	3,376	3,049	5,814	7,260	31,960
Volatile suspended solids	.	.	.	.	.	2,309	.	.	2,309
Zinc	2	9	2	3	3	10	2	10	41

. = not monitored at this mill
* = not found more than 5% of the time at this mill.

TABLE 1.4
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN CORRUGATING PROCESS EFFLUENT

PARAMETER	Mill		Total
	Domtar (Tr.)	MacMillan	
Aluminum	12	13	25
Ammonia plus Ammonium	1	131	132
BOD, 5 day, Total Demand	5,130	32,012	37,142
COD	12,009	.	12,009
DOC	.	32,394	32,394
Dehydroabietic Acid	5	2	7
Nitrate+Nitrite	3	6,793	6,796
Total Kjeldahl Nitrogen	32	501	533
Total phosphorus	5	53	58
Total suspended solids	623	2,624	3,247
Volatile suspended solids	.	1,857	1,857
Zinc	1	9	10

. = not monitored at this mill

TABLE 1.5
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN DEINKING/BOARD/FINE PAPERS/TISSUE PROCESS EFFLUENT

	Mill								
PARAMETER	Beaver	Domtar (St.C)	Eddy (O)	KC (H)	KC (St.C)	Noranda	Strathcona	Sonoco	Total
Adsorbable Organic Halide	.	.	.	.	.	115	.	.	115
Aluminum	12	15	22	0.03	1	97	3	22	172
Ammonia plus Ammonium	*	*	1.6	*	*	2.7	7.1	0.4	11.8
BOD, 5 day, Total Demand	1,920	1,025	1,148	3	319	3,463	386	1,509	9,773
COD	.	8,680	2,735	62	1,064	.	1,502	3,461	17,504
DOC	1,040	.	.	.	.	1,714	.	.	2,755
Dehydroabietic Acid	12	10	3	0.01	1	7	1	2	36
Nitrate+Nitrite	2	3	2	0.1	1	11	*	0.4	19.5
Total Kjeldahl Nitrogen	35	19	27	5	19	29	37	13	184
Total phosphorus	2	*	1	0.2	1	2	2	1	9.2
Total suspended solids	688	379	450	4	66	1,569	214	524	3,894
Volatile suspended solids	.	.	.	.	.	748	208	.	956
Zinc	0.46	0.16	0.15	0.01	6.59	2.13	0.07	0.54	10.11

. = not monitored at this mill.
* = not found more than 5% of the time at this mill.

(Notes)

TABLE 2.1a
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
PROCESS EFFLUENT
(Control Point 0100)

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	331	100	6.65		
4a	Total Kjeldahl Nitrogen	11	100	2.76	mg/L	1
5a	DOC	332	100	357.61	mg/L	1
6	Total phosphorus	11	91	.38	mg/L	1
7	Specific conductance	331	100	908.49	µS/cm	1
8	Total suspended solids	332	100	31.11	mg/L	1
9	Aluminum	48	100	428.33	µg/L	1
	Copper	9	67	40.33	µg/L	1
	Zinc	48	98	46.23	µg/L	1
16	1,2-Dichloroethane	11	45	.65	µg/L	X
	Chloroform	11	100	25.45	µg/L	2
	Methylene chloride	11	64	6.21	µg/L	X
17	Toluene	11	91	7.08	µg/L	1
20	Phenol	10	100	19.59	µg/L	2
	m-Cresol	10	70	4.88	µg/L	1
	p-Cresol	10	90	7.24	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	83	.10	ng/L	1
26	Abietic Acid	11	100	2.77	mg/L	1
	Dehydroabietic Acid	144	99	3.67	mg/L	1
	Isopimaric Acid	11	100	2.56	mg/L	1
	Levopimaric Acid	11	91	.22	mg/L	1
	Neoabietic Acid	11	100	.27	mg/L	1
	Oleic Acid	11	82	.09	mg/L	1
	Pimaric Acid	11	100	.48	mg/L	1
M8	BOD, 5 day, Total Demand	143	100	442.22	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.1b
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
PROCESS EFFLUENT
(Control Point 0200)

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	331	100	6.99		
4a	Ammonia plus Ammonium	11	36	.27	mg/L	1
	Total Kjeldahl Nitrogen	11	100	5.74	mg/L	1
5a	DOC	332	100	546.60	mg/L	1
6	Total phosphorus	10	100	1.72	mg/L	1
7	Specific conductance	331	100	1,251.92	µS/cm	1
8	Total suspended solids	332	100	124.81	mg/L	1
9	Aluminum	50	100	1,314.66	µg/L	1
	Copper	8	75	51.50	µg/L	1
	Zinc	50	100	165.74	µg/L	1
16	1,2-Dichloroethane	11	45	.65	µg/L	X
	Chloroform	11	100	5.71	µg/L	2
	Methylene chloride	11	64	12.60	µg/L	X
17	Toluene	11	91	26.30	µg/L	1
	o-Xylene	11	36	.45	µg/L	1
19	Camphene	11	73	6.36	µg/L	1
20	Phenol	11	100	62.64	µg/L	2
	m-Cresol	11	91	17.29	µg/L	1
	p-Cresol	11	100	85.53	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	83	.09	ng/L	1
26	Abietic Acid	11	100	4.05	mg/L	1
	Dehydroabietic Acid	145	100	6.55	mg/L	1
	Isopimaric Acid	10	100	3.27	mg/L	1
	Levopimaric Acid	11	91	1.69	mg/L	1
	Neoabietic Acid	11	91	1.25	mg/L	1
	Oleic Acid	11	73	.37	mg/L	1
	Pimaric Acid	11	100	1.01	mg/L	1
M8	BOD, 5 day, Total Demand	144	100	774.14	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.2
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	334	100	5.17		
4a	Total Kjeldahl Nitrogen	11	100	3.45	mg/L	1
4b	Nitrate+Nitrite	11	36	.23	mg/L	1
5a	DOC	334	100	738.61	mg/L	1
6	Total phosphorus	11	100	.81	mg/L	1
7	Specific conductance	334	100	1,072.35	µS/cm	1
8	Total suspended solids	334	100	119.36	mg/L	1
9	Aluminum	48	100	2,927.81	µg/L	1
	Copper	11	100	30.91	µg/L	1
	Zinc	47	98	133.85	µg/L	1
16	1,2-Dichloroethane	11	45	.65	µg/L	X
	Chloroform	11	91	17.81	µg/L	1
	Methylene chloride	11	64	3.58	µg/L	X
17	Benzene	11	45	1.80	µg/L	3
	Toluene	11	55	.56	µg/L	3
19	Camphene	11	55	5.32	µg/L	1
20	Phenol	11	82	2.83	µg/L	1
	m-Cresol	11	55	2.75	µg/L	1
24	Octachlorodibenzofuran	2	100	.09	ng/L	1
26	Abietic Acid	11	100	2.40	mg/L	1
	Dehydroabietic Acid	140	100	4.08	mg/L	1
	Isopimaric Acid	11	91	1.80	mg/L	1
	Levopimaric Acid	11	73	.21	mg/L	1
	Neoabietic Acid	11	100	.32	mg/L	1
	Oleic Acid	11	73	.08	mg/L	1
	Pimaric Acid	11	91	.32	mg/L	1
M8	BOD, 5 day, Total Demand	142	100	774.01	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.3
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	311	100	7.07		
4a	Ammonia plus Ammonium	11	36	.23	mg/L	1
	Total Kjeldahl Nitrogen	11	100	1.11	mg/L	1
4b	Nitrate+Nitrite	11	64	.27	mg/L	1
5a	DOC	314	100	61.56	mg/L	1
7	Specific conductance	314	100	342.08	μS/cm	1
8	Total suspended solids	311	100	33.46	mg/L	1
9	Aluminum	48	100	1,816.67	μg/L	1
	Zinc	48	94	33.96	μg/L	1
16	1,2-Dichloroethane	11	45	.65	μg/L	X
	Chloroform	11	100	3.93	μg/L	1
	Methylene chloride	11	64	7.53	μg/L	X
17	Benzene	11	45	1.26	μg/L	2
	Styrene	11	73	1.26	μg/L	1
	Toluene	11	45	.52	μg/L	1
	o-Xylene	11	36	2.20	μg/L	1
26	Abietic Acid	11	55	.02	mg/L	1
	Dehydroabietic Acid	136	98	.46	mg/L	1
	Isopimaric Acid	11	91	.04	mg/L	1
	Pimaric Acid	11	55	.02	mg/L	1
M8	BOD, 5 day, Total Demand	134	100	89.81	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.4
ABITIBI-PRICE INC., THUNDER BAY DIVISION
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	331	100	4.88		
4a	Total Kjeldahl Nitrogen	12	100	1.85	mg/L	1
4b	Nitrate+Nitrite	12	42	.21	mg/L	1
5a	DOC	326	100	607.42	mg/L	1
6	Total phosphorus	12	100	.24	mg/L	1
7	Specific conductance	331	100	694.91	µS/cm	1
8	Total suspended solids	331	100	39.85	mg/L	1
9	Aluminum	49	100	1,168.08	µg/L	1
	Zinc	49	100	73.83	µg/L	1
16	1,2-Dichloroethane	11	45	.65	µg/L	X
	Chloroform	11	73	2.70	µg/L	1
	Methylene chloride	11	45	3.30	µg/L	X
17	Benzene	11	36	1.89	µg/L	3
	Toluene	11	64	.74	µg/L	1
20	Phenol	11	55	3.62	µg/L	1
	m-Cresol	11	64	5.22	µg/L	1
	p-Cresol	11	36	9.17	µg/L	1
24	Octachlorodibenzo-p-dioxin	9	44	1.58	ng/L	3
26	Abietic Acid	11	100	1.51	mg/L	1
	Dehydroabietic Acid	142	100	1.68	mg/L	1
	Isopimaric Acid	11	91	.60	mg/L	1
	Levopimaric Acid	11	91	.16	mg/L	1
	Neoabietic Acid	11	91	.22	mg/L	1
	Oleic Acid	11	82	.10	mg/L	1
	Pimaric Acid	11	91	.14	mg/L	1
M8	BOD, 5 day, Total Demand	144	100	603.31	mg/L	

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.5
BEAVER WOOD FIBRE COMPANY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	260	100	7.27		
4a	Total Kjeldahl Nitrogen	12	100	2.18	mg/L	1
5a	DOC	259	100	68.43	mg/L	1
6	Total phosphorus	12	58	.12	mg/L	1
7	Specific conductance	259	100	379.67	µS/cm	1
8	Total suspended solids	258	100	45.29	mg/L	1
9	Aluminum	45	100	774.11	µg/L	1
	Copper	12	33	9.67	µg/L	3
	Zinc	44	95	29.30	µg/L	3
16	1,1-Dichloroethylene	12	58	5.73	µg/L	3
	Methylene chloride	12	33	2.01	µg/L	X
17	Benzene	12	33	.77	µg/L	3
	Toluene	12	92	4.98	µg/L	1
	m-Xylene and p-Xylene	12	42	.95	µg/L	3
	o-Xylene	12	33	.43	µg/L	1
20	Phenol	12	83	8.33	µg/L	1
24	Octachlorodibenzo-p-dioxin	2	100	.07	ng/L	1
26	Abietic Acid	12	67	.11	mg/L	3
	Dehydroabietic Acid	12	100	.72	mg/L	1
	Isopimaric Acid	12	100	.14	mg/L	1
	Levopimaric Acid	12	42	.06	mg/L	3
	Neoabietic Acid	12	33	.02	mg/L	2
	Oleic Acid	11	45	.08	mg/L	3
	Pimaric Acid	12	83	.04	mg/L	1
M8	BOD, 5 day, Total Demand	137	100	123.13	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.6
BOISE CASCADE CANADA LTD., FORT FRANCES
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	362	100	745.93	mg/L	1
3	Hydrogen ion (pH)	364	100	6.83		
4a	Total Kjeldahl Nitrogen	52	100	9.31	mg/L	1
6	Total phosphorus	52	100	1.82	mg/L	1
7	Specific conductance	363	100	1,615.47	µS/cm	1
8	Total suspended solids	364	100	135.82	mg/L	1
	Volatile suspended solids	52	100	126.65	mg/L	1
9	Aluminum	52	100	1,134.62	µg/L	1
	Copper	12	100	22.08	µg/L	1
	Thallium	12	58	26.25	µg/L	X
	Zinc	52	100	167.19	µg/L	1
15	Sulphide	12	100	.24	mg/L	1
16	Bromodichloromethane	12	92	.94	µg/L	X
	Chloroform	12	100	743.58	µg/L	1
	Methylene chloride	12	33	24.61	µg/L	X
17	Toluene	12	92	13.30	µg/L	1
19	Benzo(g,h,i)perylene	11	100	1.70	µg/L	X
	Benzo(k)fluoranthene	12	92	.78	µg/L	X
	Camphene	12	83	15.09	µg/L	1
	Dibenz(a,h)anthracene	11	100	1.40	µg/L	X
20	2,3,5-Trichlorophenol	12	67	4.42	µg/L	X
	2,4,6-Trichlorophenol	12	42	6.92	µg/L	1
	2,4-Dichlorophenol	12	67	3.62	µg/L	1
	o-Cresol	12	67	8.63	µg/L	1
23	1,2,3,5-Tetrachlorobenzene	5	60	1.02	µg/L	X
	1,2,3-Trichlorobenzene	10	70	.78	µg/L	X
	1,2,4,5-Tetrachlorobenzene	5	80	.09	µg/L	X
	2,4,5-Trichlorotoluene	10	100	.83	µg/L	X
	Hexachlorobenzene	11	64	.11	µg/L	X
	Hexachlorocyclopentadiene	9	56	.06	µg/L	X
	Octachlorostyrene	10	50	.03	µg/L	X
	Pentachlorobenzene	11	45	.14	µg/L	X
24	Total TCDF	11	73	.16	ng/L	1
	Octachlorodibenzo-p-dioxin	11	36	.03	ng/L	1
26	Abietic Acid	12	58	.06	mg/L	1
	Chlorodehydroabietic Acid	11	82	.10	mg/L	2
	Dehydroabietic Acid	149	94	.40	mg/L	1
	Dichlorodehydroabietic Acid	148	93	.14	mg/L	1
	Isopimaric Acid	11	100	.18	mg/L	1
	Levopimaric Acid	11	73	.02	mg/L	1
	Neoabietic Acid	12	67	.02	mg/L	1
	Oleic Acid	11	82	.19	mg/L	1
	Pimaric Acid	11	91	.08	mg/L	1
M8	BOD, 5 day, Total Demand	157	100	118.98	mg/L	1
M13	Adsorbable Organic Halide	158	100	24.56	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.7
BOISE CASCADE CANADA LTD., KENORA
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	356	100	1,952.83	mg/L	1
3	Hydrogen ion (pH)	361	100	4.61		
4a	Total Kjeldahl Nitrogen	12	100	2.04	mg/L	1
4b	Nitrate+Nitrite	12	42	.23	mg/L	1
6	Total phosphorus	12	100	.31	mg/L	1
7	Specific conductance	361	100	970.63	µS/cm	1
8	Total suspended solids	362	100	66.21	mg/L	1
9	Aluminum	52	100	333.40	µg/L	1
	Copper	12	100	16.25	µg/L	1
	Zinc	52	100	57.16	µg/L	1
16	Bromodichloromethane	12	92	1.41	µg/L	X
	Chloroform	12	75	7.44	µg/L	1
19	Benzo(g,h,i)perylene	12	92	1.61	µg/L	X
	Benzo(k)fluoranthene	12	92	.78	µg/L	X
	Dibenz(a,h)anthracene	12	92	1.33	µg/L	X
23	1,2,3-Trichlorobenzene	11	91	.09	µg/L	X
	1,2,4-Trichlorobenzene	10	60	.07	µg/L	X
	2,4,5-Trichlorotoluene	7	71	.37	µg/L	X
	Pentachlorobenzene	11	36	.02	µg/L	X
24	Octachlorodibenzo-p-dioxin	6	83	.17	ng/L	1
26	Abietic Acid	11	100	4.21	mg/L	1
	Chlorodehydroabietic Acid	12	92	.14	mg/L	2
	Dehydroabietic Acid	145	99	4.29	mg/L	1
	Isopimaric Acid	11	100	5.02	mg/L	1
	Levopimaric Acid	9	44	.33	mg/L	1
	Neoabietic Acid	11	82	.94	mg/L	1
	Oleic Acid	11	100	1.02	mg/L	1
	Pimaric Acid	11	100	.74	mg/L	1
M8	BOD, 5 day, Total Demand	154	100	651.19	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.8
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	360	100	533.28	mg/L	1
3	Hydrogen ion (pH)	360	100	7.21		
4a	Ammonia plus Ammonium	53	83	.86	mg/L	1
	Total Kjeldahl Nitrogen	53	94	1.99	mg/L	1
4b	Nitrate+Nitrite	53	100	8.86	mg/L	1
6	Total phosphorus	12	100	1.25	mg/L	1
7	Specific conductance	360	100	1,728.04	µS/cm	1
8	Total suspended solids	360	100	55.98	mg/L	1
	Volatile suspended solids	52	96	52.62	mg/L	1
9	Aluminum	65	92	1,245.39	µg/L	1
	Molybdenum	12	75	20.46	µg/L	X
	Thallium	12	58	27.92	µg/L	X
	Zinc	65	92	109.23	µg/L	1
15	Sulphide	12	92	.08	mg/L	1
16	Bromodichloromethane	11	100	1.46	µg/L	X
	Chloroform	11	100	124.55	µg/L	2
19	Benzo(g,h,i)perylene	12	92	1.61	µg/L	X
	Benzo(k)fluoranthene	12	92	.78	µg/L	X
	Dibenz(a,h)anthracene	12	92	1.33	µg/L	X
20	2,3,5-Trichlorophenol	12	83	10.28	µg/L	X
	2,4-Dichlorophenol	12	75	3.83	µg/L	1
23	1,2,3,4-Tetrachlorobenzene	8	38	.02	µg/L	X
	1,2,3,5-Tetrachlorobenzene	8	38	.31	µg/L	X
	1,2,3-Trichlorobenzene	9	100	.74	µg/L	X
	1,2,4,5-Tetrachlorobenzene	9	44	.06	µg/L	X
	2,4,5-Trichlorotoluene	8	63	.41	µg/L	X
	Hexachlorobenzene	9	44	.48	µg/L	X
	Hexachlorobutadiene	8	75	.04	µg/L	X
	Octachlorostyrene	7	71	.23	µg/L	X
	Pentachlorobenzene	9	56	.15	µg/L	X
24	Total TCDF	12	67	.06	ng/L	1
26	Abietic Acid	12	50	.02	mg/L	1
	Chlorodehydroabietic Acid	12	83	.05	mg/L	1
	Dehydroabietic Acid	159	97	.07	mg/L	1
	Dichlorodehydroabietic Acid	158	97	.06	mg/L	1
	Isopimaric Acid	12	58	.01	mg/L	3
	Levopimaric Acid	12	33	.01	mg/L	1
	Neoabietic Acid	12	50	.01	mg/L	2
	Oleic Acid	12	83	.06	mg/L	1
	Pimaric Acid	12	42	.01	mg/L	3
M8	BOD, 5 day, Total Demand	158	100	31.07	mg/L	1
M13	Adsorbable Organic Halide	158	100	21.62	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.9
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	279	100	975.21	mg/L	1
3	Hydrogen ion (pH)	280	100	6.59		
4a	Total Kjeldahl Nitrogen	40	95	1.49	mg/L	1
6	Total phosphorus	40	100	.66	mg/L	1
7	Specific conductance	281	100	1,565.31	µS/cm	1
8	Total suspended solids	281	100	86.86	mg/L	1
9	Aluminum	43	100	4,781.40	µg/L	1
	Chromium	10	100	67.98	µg/L	1
	Copper	10	100	22.60	µg/L	1
	Zinc	43	100	161.52	µg/L	1
15	Sulphide	10	90	.13	mg/L	1
16	Bromodichloromethane	10	90	.95	µg/L	X
	Chloroform	10	100	1,520.94	µg/L	1
19	Benzo(g,h,i)perylene	10	100	1.70	µg/L	X
	Benzo(k)fluoranthene	10	100	.80	µg/L	X
	Dibenz(a,h)anthracene	10	100	1.40	µg/L	X
20	2,3,5-Trichlorophenol	10	40	3.13	µg/L	X
	2,4,6-Trichlorophenol	10	50	5.27	µg/L	1
	2,4-Dichlorophenol	10	90	3.91	µg/L	1
	Phenol	10	90	27.85	µg/L	2
23	1,2,3-Trichlorobenzene	9	78	.69	µg/L	X
	1,2,4,5-Tetrachlorobenzene	6	50	.20	µg/L	X
	2,4,5-Trichlorotoluene	10	70	1.44	µg/L	X
	Hexachlorobenzene	8	88	.49	µg/L	X
	Hexachlorobutadiene	6	50	.05	µg/L	X
	Hexachloroethane	9	56	.04	µg/L	X
	Octachlorostyrene	9	67	.06	µg/L	X
24	Total TCDF	11	64	.05	ng/L	1
	Octachlorodibenzo-p-dioxin	11	36	.13	ng/L	1
26	Abietic Acid	10	70	.66	mg/L	1
	Chlorodehydroabietic Acid	10	80	.31	mg/L	1
	Dehydroabietic Acid	120	100	1.79	mg/L	1
	Dichlorodehydroabietic Acid	119	99	.06	mg/L	1
	Isopimaric Acid	10	70	.81	mg/L	1
	Levopimaric Acid	9	44	.05	mg/L	1
	Neoabietic Acid	10	60	.17	mg/L	1
	Oleic Acid	10	80	.27	mg/L	1
	Pimaric Acid	10	70	.15	mg/L	1
M8	BOD, 5 day, Total Demand	121	100	276.84	mg/L	1
M13	Adsorbable Organic Halide	131	100	23.91	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.10
DOMTAR INC., CONTAINERBOARD DIVISION (RED ROCK) PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	358	100	423.27	mg/L	1
3	Hydrogen ion (pH)	361	100	8.37		
4a	Ammonia plus Ammonium	11	82	.41	mg/L	1
	Total Kjeldahl Nitrogen	11	100	1.78	mg/L	1
6	Total phosphorus	11	100	.23	mg/L	1
7	Specific conductance	361	100	677.03	µS/cm	1
8	Total suspended solids	361	100	62.13	mg/L	1
9	Aluminum	48	100	2,977.92	µg/L	1
	Zinc	48	100	38.54	µg/L	1
15	Sulphide	11	100	.41	mg/L	1
16	Chloroform	11	100	133.63	µg/L	1
20	2,4,6-Trichlorophenol	9	56	2.83	µg/L	1
	Phenol	11	82	9.64	µg/L	1
24	Octachlorodibenzo-p-dioxin	12	92	.33	ng/L	1
26	Abietic Acid	11	100	.86	mg/L	1
	Dehydroabietic Acid	144	100	1.14	mg/L	1
	Dichlorodehydroabietic Acid	143	20	.02	mg/L	1
	Isopimaric Acid	11	100	.23	mg/L	2
	Neoabietic Acid	11	100	1.29	mg/L	1
	Oleic Acid	11	91	.07	mg/L	1
	Pimaric Acid	11	91	.09	mg/L	1
M8	BOD, 5 day, Total Demand	157	100	157.88	mg/L	1
M13	Adsorbable Organic Halide	144	99	1.78	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.11
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	2,978.18	mg/L	1
3	Hydrogen ion (pH)	355	100	7.92		
4a	Ammonia plus Ammonium	12	50	.36	mg/L	1
	Total Kjeldahl Nitrogen	12	100	7.89	mg/L	1
4b	Nitrate+Nitrite	12	100	.63	mg/L	1
6	Total phosphorus	12	100	1.14	mg/L	1
7	Specific conductance	355	100	1,096.45	µS/cm	1
8	Total suspended solids	355	100	157.04	mg/L	1
9	Aluminum	53	100	3,073.77	µg/L	1
	Cadmium	12	67	3.50	µg/L	1
	Chromium	12	33	21.67	µg/L	1
	Copper	12	100	41.67	µg/L	1
	Zinc	53	100	169.81	µg/L	1
16	Chloroform	7	86	3.23	µg/L	1
20	Phenol	12	100	643.11	µg/L	1
	o-Cresol	12	92	9.98	µg/L	1
24	Total TCDF	2	100	.09	ng/L	1
	Total H6CDD	2	100	.30	ng/L	1
	Total H7CDD	2	100	1.10	ng/L	1
	Total H7CDF	2	100	.32	ng/L	1
	Octachlorodibenzo-p-dioxin	2	100	10.90	ng/L	1
	Octachlorodibenzofuran	2	100	.80	ng/L	1
26	Abietic Acid	12	100	.61	mg/L	1
	Chlorodehydroabietic Acid	12	67	.02	mg/L	2
	Dehydroabietic Acid	157	100	1.17	mg/L	1
	Isopimaric Acid	12	100	.25	mg/L	1
	Neoabietic Acid	12	67	.82	mg/L	1
	Oleic Acid	12	100	.40	mg/L	1
	Pimaric Acid	12	92	.13	mg/L	1
M8	BOD, 5 day, Total Demand	150	100	1,278.72	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.12
DOMTAR INC., FINE PAPERS DIVISION (CORNWALL)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	467.39	mg/L	1
3	Hydrogen ion (pH)	354	100	7.23		
4a	Ammonia plus Ammonium	12	42	.49	mg/L	1
	Total Kjeldahl Nitrogen	12	100	3.32	mg/L	1
4b	Nitrate+Nitrite	12	33	.25	mg/L	1
6	Total phosphorus	12	100	.34	mg/L	1
7	Specific conductance	355	100	1,089.90	µS/cm	1
8	Total suspended solids	353	100	75.65	mg/L	1
9	Aluminum	52	100	1,587.50	µg/L	1
	Copper	12	58	12.50	µg/L	1
	Zinc	52	100	44.90	µg/L	1
15	Sulphide	12	100	.34	mg/L	1
16	Bromodichloromethane	2	100	2.75	µg/L	1
	Chloroform	12	100	238.83	µg/L	1
17	Benzene	12	100	10.47	µg/L	1
	Styrene	5	100	4.12	µg/L	1
	Toluene	10	100	6.67	µg/L	1
19	Acenaphthylene	6	100	4.52	µg/L	1
	Chrysene	6	67	1.45	µg/L	1
	Fluoranthene	8	100	4.99	µg/L	1
	Naphthalene	6	100	7.78	µg/L	1
	Phenanthrene	11	100	11.83	µg/L	1
	Pyrene	7	100	3.01	µg/L	1
20	Phenol	12	100	103.53	µg/L	3
	o-Cresol	7	71	4.89	µg/L	1
24	Total TCDF	11	91	.04	ng/L	1
	Octachlorodibenzo-p-dioxin	11	100	.17	ng/L	1
26	Abietic Acid	12	100	.19	mg/L	1
	Chlorodehydroabietic Acid	12	100	.04	mg/L	1
	Dehydroabietic Acid	155	100	.46	mg/L	1
	Dichlorodehydroabietic Acid	155	30	.01	mg/L	1
	Isopimaric Acid	12	67	.01	mg/L	1
	Levopimaric Acid	4	75	.02	mg/L	1
	Neoabietic Acid	12	75	.07	mg/L	1
	Oleic Acid	12	100	.10	mg/L	1
	Pimaric Acid	12	50	.01	mg/L	1
M8	BOD, 5 day, Total Demand	151	100	162.27	mg/L	1
M13	Adsorbable Organic Halide	155	99	3.31	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.13
DOMTAR INC., FINE PAPERS DIVISION (ST. CATHARINES)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	354	100	834.68	mg/L	1
3	Hydrogen ion (pH)	355	100	6.88		
4a	Total Kjeldahl Nitrogen	11	100	1.83	mg/L	1
4b	Nitrate+Nitrite	12	58	.29	mg/L	1
7	Specific conductance	356	100	391.24	µS/cm	1
8	Total suspended solids	356	99	37.51	mg/L	1
9	Aluminum	51	98	1,456.92	µg/L	1
	Copper	12	33	8.33	µg/L	1
	Zinc	50	72	16.26	µg/L	3
16	Chloroform	12	50	1.80	µg/L	1
	Methylene chloride	12	50	11.24	µg/L	X
17	Benzene	12	33	1.36	µg/L	1
24	Total H6CDF	6	100	.02	ng/L	X
	Octachlorodibenzo-p-dioxin	5	100	.21	ng/L	X
26	Abietic Acid	12	83	.14	mg/L	1
	Chlorodehydroabietic Acid	12	42	.02	mg/L	2
	Dehydroabietic Acid	12	100	.99	mg/L	1
	Isopimaric Acid	12	92	.06	mg/L	1
	Levopimaric Acid	12	67	.07	mg/L	1
	Pimaric Acid	12	50	.05	mg/L	1
M8	BOD, 5 day, Total Demand	158	100	100.81	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.14
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	359	100	7.61		
4a	Ammonia plus Ammonium	12	75	1.01	mg/L	1
	Total Kjeldahl Nitrogen	12	100	3.48	mg/L	1
5a	DOC	359	100	114.66	mg/L	1
6	Total phosphorus	12	100	.51	mg/L	1
7	Specific conductance	359	100	1,469.81	µS/cm	1
8	Total suspended solids	359	95	24.96	mg/L	1
	Volatile suspended solids	54	78	16.47	mg/L	1
9	Aluminum	63	100	767.94	µg/L	1
	Copper	7	57	51.86	µg/L	1
	Nickel	11	73	31.36	µg/L	1
	Zinc	60	97	85.10	µg/L	1
15	Sulphide	12	100	1.00	mg/L	1
16	Chloroform	12	100	16.44	µg/L	1
	Methylene chloride	12	50	15.03	µg/L	X
17	Benzene	12	50	2.70	µg/L	1
	Toluene	12	33	.68	µg/L	1
20	2,4,6-Trichlorophenol	12	75	3.78	µg/L	1
24	Total TCDF	10	50	.04	ng/L	1
26	Dehydroabietic Acid	167	38	.02	mg/L	1
M8	BOD, 5 day, Total Demand	164	98	17.30	mg/L	1
M13	Adsorbable Organic Halide	152	100	8.20	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.15
E.B. EDDY FOREST PRODUCTS LTD., OTTAWA
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	329	100	369.22	mg/L	1
3	Hydrogen ion (pH)	329	100	7.37		
4a	Ammonia plus Ammonium	12	50	.21	mg/L	1
	Total Kjeldahl Nitrogen	12	100	3.59	mg/L	1
4b	Nitrate+Nitrite	12	75	.27	mg/L	1
7	Specific conductance	329	100	363.13	µS/cm	1
8	Total suspended solids	329	100	61.07	mg/L	1
9	Aluminum	54	100	2,977.59	µg/L	1
	Copper	11	55	9.18	µg/L	1
	Zinc	54	61	21.91	µg/L	1
16	1,2-Dichloroethane	12	50	1.06	µg/L	X
	Chloroform	12	83	3.66	µg/L	1
19	Naphthalene	11	55	1.97	µg/L	1
23	1,2,3,4-Tetrachlorobenzene	12	33	.01	µg/L	1
	1,2,3-Trichlorobenzene	12	33	.01	µg/L	1
	1,2,4-Trichlorobenzene	12	50	.02	µg/L	2
26	Abietic Acid	11	73	.04	mg/L	3
	Dehydroabietic Acid	11	82	.42	mg/L	1
	Pimaric Acid	11	36	.01	mg/L	3
M8	BOD, 5 day, Total Demand	156	100	156.62	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.16
JAMES RIVER-MARATHON LTD.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	347	100	770.84	mg/L	1
3	Hydrogen ion (pH)	347	100	3.77		
4a	Ammonia plus Ammonium	12	100	2.48	mg/L	1
	Total Kjeldahl Nitrogen	12	100	2.95	mg/L	1
6	Total phosphorus	11	100	.59	mg/L	1
7	Specific conductance	347	100	2,159.11	µS/cm	1
8	Total suspended solids	347	100	44.20	mg/L	1
9	Aluminum	52	100	271.15	µg/L	1
	Chromium	8	38	18.00	µg/L	1
	Copper	10	70	27.00	µg/L	1
	Nickel	12	42	30.00	µg/L	1
	Vanadium	11	36	30.91	µg/L	X
	Zinc	51	96	68.04	µg/L	1
12	Mercury	9	56	.49	µg/L	1
15	Sulphide	12	100	1.21	mg/L	1
16	Chloroform	12	100	772.02	µg/L	2
19	Camphene	12	33	2.39	µg/L	1
24	Total TCDD	12	58	.04	ng/L	1
	Total TCDF	12	100	.28	ng/L	1
	Total PCDD	12	42	.03	ng/L	1
	Total PCDF	12	75	.17	ng/L	1
	Total H6CDF	12	33	.05	ng/L	1
	Total H7CDD	12	58	.11	ng/L	2
	Octachlorodibenzo-p-dioxin	12	100	.42	ng/L	1
	Octachlorodibenzofuran	12	33	.05	ng/L	1
26	Abietic Acid	12	100	.11	mg/L	1
	Chlorodehydroabietic Acid	12	100	.20	mg/L	1
	Dehydroabietic Acid	155	99	.05	mg/L	1
	Dichlorodehydroabietic Acid	156	99	.04	mg/L	1
	Isopimaric Acid	12	100	.05	mg/L	1
	Levopimaric Acid	12	100	.05	mg/L	1
	Neoabietic Acid	12	100	.06	mg/L	1
	Oleic Acid	12	100	.11	mg/L	1
	Pimaric Acid	12	100	.03	mg/L	1
M8	BOD, 5 day, Total Demand	155	100	200.47	mg/L	1
M13	Adsorbable Organic Halide	157	100	44.97	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.17
KIMBERLY-CLARK CANADA INC., HUNTSVILLE
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	169	100	79.72	mg/L	1
3	Hydrogen ion (pH)	170	100	7.23		
4a	Total Kjeldahl Nitrogen	6	100	6.17	mg/L	1
6	Total phosphorus	6	100	.22	mg/L	1
7	Specific conductance	170	100	492.68	µS/cm	1
9	Aluminum	23	61	49.13	µg/L	1
	Copper	6	67	13.33	µg/L	1
	Zinc	23	43	15.65	µg/L	1
16	Chloroform	6	100	3.57	µg/L	1
24	Octachlorodibenzo-p-dioxin	4	100	.20	ng/L	3
M8	BOD, 5 day, Total Demand	65	20	4.09	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.18
KIMBERLY-CLARK CANADA INC., ST. CATHARINES
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	315	100	123.47	mg/L	1
3	Hydrogen ion (pH)	342	100	6.44		
4a	Total Kjeldahl Nitrogen	11	100	2.15	mg/L	1
6	Total phosphorus	11	64	.16	mg/L	1
7	Specific conductance	341	100	389.54	µS/cm	1
8	Total suspended solids	342	65	7.54	mg/L	1
9	Aluminum	50	100	117.83	µg/L	1
	Zinc	49	71	815.27	µg/L	1
16	1,1-Dichloroethane	12	50	.92	µg/L	1
	Methylene chloride	12	50	2.20	µg/L	X
	Tetrachloroethylene	12	42	1.60	µg/L	1
	Trichloroethylene	12	42	5.40	µg/L	1
17	Toluene	12	92	1.84	µg/L	1
19	2-Methylnaphthalene	12	75	3.69	µg/L	1
	Naphthalene	12	67	4.40	µg/L	1
20	Phenol	12	58	3.72	µg/L	1
24	Total TCDF	6	50	.02	ng/L	1
26	Abietic Acid	12	58	.03	mg/L	1
	Dehydroabietic Acid	11	73	.09	mg/L	1
	Isopimaric Acid	11	55	.02	mg/L	1
	Levopimaric Acid	12	33	.01	mg/L	1
	Oleic Acid	11	64	.07	mg/L	3
	Pimaric Acid	11	64	.02	mg/L	1
M8	BOD, 5 day, Total Demand	145	100	37.82	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.19
KIMBERLY-CLARK CANADA INC., TERRACE BAY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	364	100	525.08	mg/L	1
3	Hydrogen ion (pH)	364	100	7.67		
4a	Ammonia plus Ammonium	53	89	.92	mg/L	1
	Total Kjeldahl Nitrogen	53	100	4.66	mg/L	1
4b	Nitrate+Nitrite	42	24	.38	mg/L	1
6	Total phosphorus	53	100	.49	mg/L	1
7	Specific conductance	364	100	1,895.80	µS/cm	1
8	Total suspended solids	364	100	42.51	mg/L	1
	Volatile suspended solids	52	100	39.09	mg/L	1
9	Aluminum	53	100	512.64	µg/L	1
	Chromium	12	92	148.33	µg/L	1
	Copper	12	33	10.83	µg/L	1
	Nickel	12	33	13.33	µg/L	1
	Zinc	53	98	89.62	µg/L	1
12	Mercury	12	33	.10	µg/L	X
15	Sulphide	12	50	.38	mg/L	1
16	Chloroform	12	100	11.97	µg/L	1
20	2,4,6-Trichlorophenol	12	75	4.84	µg/L	1
	2,4-Dichlorophenol	12	67	2.36	µg/L	1
24	2,3,7,8 TCDD	12	67	.03	ng/L	1
	Total TCDD	12	100	.32	ng/L	1
	Total TCDF	12	100	.32	ng/L	1
	Total PCDD	12	58	.04	ng/L	1
	Total PCDF	12	83	.04	ng/L	1
	Total H6CDD	12	58	.05	ng/L	1
	Total H7CDF	12	58	.04	ng/L	X
	Octachlorodibenzo-p-dioxin	12	100	.31	ng/L	1
	Octachlorodibenzofuran	12	58	.05	ng/L	1
26	Abietic Acid	12	50	.02	mg/L	1
	Chlorodehydroabietic Acid	12	33	.01	mg/L	1
	Dehydroabietic Acid	156	38	.01	mg/L	1
	Dichlorodehydroabietic Acid	156	17	.01	mg/L	1
	Oleic Acid	12	33	.01	mg/L	1
M8	BOD, 5 day, Total Demand	156	99	15.71	mg/L	1
M13	Adsorbable Organic Halide	157	100	21.23	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.20a
MACMILLAN-BLOEDEL LTD.
PROCESS EFFLUENT
(Control Point 1200)

ATG	PARAMETER	No.	F.D.(%)	LTA CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	341	100	5.27		
4a	Ammonia plus Ammonium	12	83	5.80	mg/L	3
	Total Kjeldahl Nitrogen	12	100	26.54	mg/L	3
4b	Nitrate+Nitrite	11	91	805.15	mg/L	3
5a	DOC	341	100	3,290.51	mg/L	3
6	Total phosphorus	12	100	2.06	mg/L	3
7	Specific conductance	340	100	2,812.13	µS/cm	3
8	Total suspended solids	341	100	98.05	mg/L	3
9	Aluminum	50	96	377.60	µg/L	3
	Cadmium	12	100	36.03	µg/L	3
	Chromium	12	33	30.17	µg/L	3
	Cobalt	12	92	44.50	µg/L	3
	Copper	12	75	42.50	µg/L	3
	Lead	12	92	72.58	µg/L	3
	Nickel	12	100	63.58	µg/L	3
	Thallium	12	42	50.00	µg/L	3
	Vanadium	12	75	68.75	µg/L	X
	Zinc	49	100	860.39	µg/L	3
26	Chlorodehydroabietic Acid	12	58	.15	mg/L	3
	Dehydroabietic Acid	123	79	.16	mg/L	3
	Isopimaric Acid	12	83	.61	mg/L	3
	Levopimaric Acid	12	58	.23	mg/L	3
	Neoabietic Acid	12	50	.08	mg/L	3
	Oleic Acid	12	58	.83	mg/L	3
	Pimaric Acid	12	75	.20	mg/L	3
M8	BOD, 5 day, Total Demand	150	100	3,312.88	mg/L	3

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.20b
MACMILLAN BLOEDEL LTD.
PROCESS EFFLUENT
(Control Point 1300)

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	343	100	6.07		
4a	Ammonia plus Ammonium	31	94	18.27	mg/L	3
	Total Kjeldahl Nitrogen	31	94	65.94	mg/L	3
4b	Nitrate+Nitrite	31	100	247.42	mg/L	3
5a	DOC	343	100	1,572.63	mg/L	3
6	Total phosphorus	31	100	8.07	mg/L	3
7	Specific conductance	343	100	1,680.40	µS/cm	3
8	Total suspended solids	343	100	359.09	mg/L	3
	Volatile suspended solids	25	100	389.04	mg/L	3
9	Aluminum	50	100	1,621.00	µg/L	3
	Cadmium	12	92	16.98	µg/L	3
	Chromium	12	42	30.75	µg/L	3
	Cobalt	12	75	36.67	µg/L	3
	Copper	12	75	61.58	µg/L	3
	Lead	12	58	50.83	µg/L	3
	Molybdenum	12	42	21.67	µg/L	3
	Nickel	12	75	66.08	µg/L	3
	Thallium	12	50	53.33	µg/L	3
	Vanadium	12	67	54.17	µg/L	X
	Zinc	48	100	572.29	µg/L	3
26	Abietic Acid	12	42	.03	mg/L	3
	Chlorodehydroabietic Acid	12	33	.03	mg/L	3
	Dehydroabietic Acid	126	83	.22	mg/L	3
	Isopimaric Acid	12	67	.61	mg/L	3
	Levopimaric Acid	12	75	1.43	mg/L	3
	Oleic Acid	12	67	.10	mg/L	3
	Pimaric Acid	12	75	.14	mg/L	3
M8	BOD, 5 day, Total Demand	149	100	1,482.52	mg/L	3

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.21
MALETTE KRAFT PULP AND POWER PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	342	100	605.71	mg/L	1
3	Hydrogen ion (pH)	342	100	5.17		
4a	Ammonia plus Ammonium	27	93	.74	mg/L	1
	Total Kjeldahl Nitrogen	27	100	2.01	mg/L	1
4b	Nitrate+Nitrite	27	30	.38	mg/L	1
6	Total phosphorus	27	100	.39	mg/L	1
7	Specific conductance	342	100	1,634.75	μS/cm	1
8	Total suspended solids	342	99	33.93	mg/L	1
9	Aluminum	43	100	3,553.49	μg/L	1
	Copper	8	50	10.00	μg/L	1
	Zinc	43	100	127.65	μg/L	1
15	Sulphide	12	100	1.77	mg/L	1
16	1,2-Dichloroethane	11	55	.79	μg/L	X
	Chloroform	11	91	154.37	μg/L	1
	Methylene chloride	11	45	4.91	μg/L	X
17	Benzene	11	36	3.84	μg/L	1
	Styrene	11	64	1.07	μg/L	3
	Toluene	11	73	2.41	μg/L	1
19	Camphene	12	50	9.50	μg/L	1
20	2,4,6-Trichlorophenol	12	58	4.55	μg/L	3
	2,4-Dichlorophenol	12	67	2.92	μg/L	3
	Phenol	12	83	23.37	μg/L	1
	m-Cresol	12	83	23.84	μg/L	1
	p-Cresol	12	33	2.82	μg/L	1
23	1,2,4-Trichlorobenzene	12	42	.01	μg/L	2
	2,4,5-Trichlorotoluene	12	58	.01	μg/L	3
24	Total TCDF	9	78	.16	ng/L	3
26	Abietic Acid	12	92	.80	mg/L	1
	Chlorodehydroabietic Acid	12	100	.10	mg/L	1
	Dehydroabietic Acid	145	99	.56	mg/L	1
	Dichlorodehydroabietic Acid	145	97	.12	mg/L	1
	Isopimaric Acid	12	100	.44	mg/L	1
	Levopimaric Acid	12	50	.32	mg/L	1
	Neoabietic Acid	12	75	.37	mg/L	1
	Pimaric Acid	12	92	.21	mg/L	1
M8	BOD, 5 day, Total Demand	145	100	155.94	mg/L	1
M13	Adsorbable Organic Halide	148	100	22.73	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.22
NORANDA FOREST INC., RECYCLED PAPERS
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	326	100	7.65		
4a	Total Kjeldahl Nitrogen	46	98	1.37	mg/L	1
4b	Nitrate+Nitrite	46	93	.53	mg/L	1
5a	DOC	322	100	77.51	mg/L	1
6	Total phosphorus	10	40	.10	mg/L	1
7	Specific conductance	325	100	923.84	μS/cm	1
8	Total suspended solids	324	100	71.50	mg/L	1
	Volatile suspended solids	46	100	34.12	mg/L	1
9	Aluminum	46	100	4,535.44	μg/L	1
	Copper	11	73	12.82	μg/L	1
	Zinc	46	100	97.52	μg/L	1
16	1,2-Dichloroethane	10	50	.67	μg/L	X
	Bromodichloromethane	10	100	5.95	μg/L	1
	Chloroform	10	100	101.34	μg/L	2
	Dibromochloromethane	10	50	1.29	μg/L	1
17	Benzene	10	50	2.21	μg/L	3
	m-Xylene and p-Xylene	10	50	1.84	μg/L	1
	o-Xylene	10	70	1.33	μg/L	1
23	Hexachlorocyclopentadiene	10	80	.17	μg/L	X
24	Octachlorodibenzo-p-dioxin	9	56	.09	ng/L	1
26	Dehydroabietic Acid	10	100	.32	mg/L	1
M8	BOD, 5 day, Total Demand	326	100	155.92	mg/L	1
M13	Adsorbable Organic Halide	10	100	5.25	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.23
QUEBEC AND ONTARIO PAPER COMPANY LTD.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	231	100	7.31		
4a	Ammonia plus Ammonium	34	79	1.84	mg/L	1
	Total Kjeldahl Nitrogen	34	100	3.67	mg/L	1
4b	Nitrate+Nitrite	34	44	.31	mg/L	1
5a	DOC	226	100	29.34	mg/L	1
6	Total phosphorus	34	79	.43	mg/L	1
7	Specific conductance	229	100	694.88	µS/cm	1
8	Total suspended solids	231	100	50.05	mg/L	1
	Volatile suspended solids	34	100	37.62	mg/L	1
9	Aluminum	34	97	668.46	µg/L	1
	Copper	8	100	23.13	µg/L	1
	Zinc	33	100	167.73	µg/L	1
16	1,2-Dichloroethane	7	71	.73	µg/L	X
	Chloroform	7	57	1.44	µg/L	1
	Methylene chloride	7	43	2.84	µg/L	X
17	Toluene	7	43	6.57	µg/L	1
26	Dehydroabietic Acid	97	36	.08	mg/L	1
M8	BOD, 5 day, Total Demand	99	100	22.19	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.24
ST. MARYS PAPER INC.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	357	100	610.74	mg/L	1
3	Hydrogen ion (pH)	362	100	6.84		
4a	Total Kjeldahl Nitrogen	12	100	1.18	mg/L	1
6	Total phosphorus	12	100	.89	mg/L	1
7	Specific conductance	358	100	284.28	µS/cm	1
8	Total suspended solids	362	100	167.78	mg/L	1
9	Aluminum	51	100	2,396.47	µg/L	1
	Copper	10	60	10.60	µg/L	1
	Zinc	51	98	57.47	µg/L	1
16	1,2-Dichloroethane	12	33	.61	µg/L	X
	Chloroform	12	58	1.33	µg/L	1
	Chloromethane	11	27	3.84	µg/L	2
	Methylene chloride	12	67	24.49	µg/L	X
17	Benzene	12	58	1.34	µg/L	3
	Toluene	12	92	2.80	µg/L	3
20	Phenol	12	42	3.33	µg/L	1
	p-Cresol	12	67	6.13	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	83	.16	ng/L	1
26	Abietic Acid	13	100	.71	mg/L	1
	Dehydroabietic Acid	149	100	2.14	mg/L	1
	Isopimaric Acid	13	92	.60	mg/L	1
	Levopimaric Acid	13	92	.31	mg/L	1
	Neoabietic Acid	13	92	.30	mg/L	1
	Oleic Acid	13	54	.06	mg/L	1
	Pimaric Acid	13	100	.20	mg/L	1
M8	BOD, 5 day, Total Demand	150	100	197.54	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.25
SONOCO LIMITED
(formerly Trent Valley Division, Paperboard Industries Corp.)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	924.95	mg/L	1
3	Hydrogen ion (pH)	357	100	6.41		
4a	Total Kjeldahl Nitrogen	12	100	3.57	mg/L	1
6	Total phosphorus	12	100	.33	mg/L	1
7	Specific conductance	335	100	832.93	µS/cm	1
8	Total suspended solids	358	100	138.30	mg/L	1
9	Aluminum	51	100	6,104.31	µg/L	1
	Chromium	12	33	14.42	µg/L	1
	Copper	12	67	14.08	µg/L	1
	Zinc	50	100	150.34	µg/L	1
16	1,1-Dichloroethane	11	36	.71	µg/L	3
	1,1-Dichloroethylene	11	91	12.85	µg/L	1
	1,2-Dichloroethane	12	50	.67	µg/L	X
	Chloroform	13	31	1.10	µg/L	1
	Methylene chloride	12	25	2.37	µg/L	X
17	Benzene	13	31	.93	µg/L	1
	Toluene	13	77	2.30	µg/L	1
19	Naphthalene	12	33	1.05	µg/L	1
20	Pentachlorophenol	11	36	.93	µg/L	1
	Phenol	11	82	59.24	µg/L	1
	m-Cresol	11	73	13.19	µg/L	2
26	Abietic Acid	12	58	.05	mg/L	1
	Chlorodehydroabietic Acid	12	33	.01	mg/L	2
	Dehydroabietic Acid	12	100	.65	mg/L	1
	Isopimaric Acid	12	100	.04	mg/L	1
	Oleic Acid	12	42	.05	mg/L	1
	Pimaric Acid	12	42	.01	mg/L	3
M8	BOD, 5 day, Total Demand	153	100	415.22	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.26
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	356	100	852.08	mg/L	1
3	Hydrogen ion (pH)	356	100	5.98		
4a	Total Kjeldahl Nitrogen	12	92	2.58	mg/L	1
6	Total phosphorus	12	100	.28	mg/L	1
7	Conductivity, average	359	100	283.69	µS/cm	1
8	Total suspended solids	356	100	86.94	mg/L	1
9	Aluminum	53	100	251.32	µg/L	1
	Copper	12	100	23.33	µg/L	1
	Zinc	53	100	116.98	µg/L	2
16	Chloroform	9	100	3.99	µg/L	1
17	Toluene	8	100	3.39	µg/L	1
20	Phenol	12	33	2.00	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	100	.38	ng/L	1
26	Abietic Acid	12	100	1.38	mg/L	1
	Chlorodehydroabietic Acid	12	58	.02	mg/L	2
	Dehydroabietic Acid	158	100	2.13	mg/L	1
	Isopimaric Acid	12	100	.47	mg/L	1
	Neoabietic Acid	12	100	1.61	mg/L	1
	Oleic Acid	12	100	.31	mg/L	1
	Pimaric Acid	12	92	.09	mg/L	1
M8	BOD, 5 day, Total Demand	158	100	424.67	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.27
STRATHCONA PAPER COMPANY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	434.51	mg/L	1
3	Hydrogen ion (pH)	355	100	7.42		
4a	Ammonia plus Ammonium	52	85	2.41	mg/L	1
	Total Kjeldahl Nitrogen	52	100	11.48	mg/L	1
6	Total phosphorus	52	100	.51	mg/L	1
7	Specific conductance	355	100	709.09	µS/cm	1
8	Total suspended solids	355	100	64.52	mg/L	1
	Volatile suspended solids	52	98	62.58	mg/L	1
9	Aluminum	52	98	816.15	µg/L	1
	Zinc	50	74	20.36	µg/L	3
16	1,2-Dichloroethane	12	42	.64	µg/L	X
	Chloroform	12	58	2.39	µg/L	3
	Methylene chloride	12	50	42.75	µg/L	X
17	Toluene	12	42	1.37	µg/L	1
20	Phenol	12	50	7.69	µg/L	3
	m-Cresol	12	42	3.21	µg/L	1
	p-Cresol	12	50	16.34	µg/L	3
26	Dehydroabietic Acid	12	92	.24	mg/L	1
	Oleic Acid	12	42	.04	mg/L	3
	Pimaric Acid	12	33	.03	mg/L	1
M8	BOD, 5 day, Total Demand	150	100	106.58	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

(Notes)

TABLE 3.1
1990 AVERAGE PROCESS EFFLUENT FLOW (m^3/day)

COMPANY NAME	AVERAGE FLOW
ABITIBI-PRICE INC., Fort William Division - 0100	22,978
- 0200	4,100
ABITIBI-PRICE INC., Iroquois Falls Division	64,946
ABITIBI-PRICE INC., Provincial Papers Division	47,679
ABITIBI-PRICE INC., Thunder Bay Division	46,739
BEAVER WOOD FIBRE COMPANY	15,114
BOISE CASCADE CANADA LTD., Fort Frances	80,710
BOISE CASCADE CANADA LTD., Kenora	51,255
CANADIAN PACIFIC FOREST PRODUCTS LTD., Dryden	89,192
CANADIAN PACIFIC FOREST PRODUCTS LTD., Thunder Bay	176,069
DOMTAR INC., Containerboard Division (Red Rock)	97,050
DOMTAR INC., Containerboard Division (Trenton)	4,028
DOMTAR INC., Fine Papers Division (Cornwall)	129,073
DOMTAR INC., Fine Papers Division (St. Catharines)	10,186
E.B. EDDY FOREST PRODUCTS LTD., Espanola	101,641
E.B. EDDY FOREST PRODUCTS LTD., Ottawa	7,401
JAMES RIVER-MARATHON LTD.	60,430
KIMBERLY-CLARK CANADA INC., Huntsville	793
KIMBERLY-CLARK CANADA INC., St. Catharines	8,755
KIMBERLY-CLARK CANADA INC., Terrace Bay	91,695
MACMILLAN BLOEDEL LTD. - 1200	7,024
- 1300	5,819
MALETTE KRAFT PULP AND POWER	51,374
NORANDA FOREST INC., Recycled Papers	22,128
QUEBEC AND ONTARIO PAPER COMPANY LTD.	61,546
ST. MARYS PAPER INC.	34,731
SONOCO LIMITED	3,744
SPRUCE FALLS POWER AND PAPER COMPANY LTD.	83,944
STRATHCONA PAPER COMPANY	3,321
Total Flow for the Sector	1,383,465

(Notes)

TABLE 4.1
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
COOLING WATER EFFLUENT (Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
DOC	11	100	77.45	mg/L	231.85
Hydrogen ion (pH)	11	100	8.10		
Specific conductance	11	100	358.64	µS/cm	
Total suspended solids	11	91	19.00	mg/L	77.21
Average Flow	330	100	4,531.56	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.2
BEAVER WOOD FIBRE COMPANY
COOLING WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
DOC	11	100	13.39	mg/L	.20
Hydrogen ion (pH)	11	100	6.79		
Specific conductance	11	100	1,049.67	µS/cm	
Total suspended solids	11	100	18.44	mg/L	.31
Average Flow	219	100	12.47	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.3
BOISE CASCADE CANADA LTD., FORT FRANCES
COOLING WATER EFFLUENT (Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	83	22.80	mg/L	56.02
Hydrogen ion (pH)	12	100	6.95		
Specific conductance	12	100	41.21	µS/cm	
Total suspended solids	12	100	15.80	mg/L	35.89
Average Flow	364	100	2,285.65	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.4
BOISE CASCADE CANADA LTD., FORT FRANCES
COOLING WATER EFFLUENT (Control Point 0700)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	83	22.58	mg/L	19.19
Hydrogen ion (pH)	12	100	7.00		
Specific conductance	12	100	43.17	µS/cm	
Total suspended solids	12	100	14.33	mg/L	12.18
Average Flow	364	100	850.00	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.5
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
COOLING WATER EFFLUENT (Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	6	100	24.17	mg/L	76.32
Hydrogen ion (pH)	6	100	7.40		
Specific conductance	6	100	65.17	µS/cm	
Average Flow	94	100	2,093.81	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.6
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
COOLING WATER EFFLUENT (Control Point 0900)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	6	100	75.83	mg/L	203.07
Hydrogen ion (pH)	6	100	7.48		
Specific conductance	6	100	227.67	µS/cm	
Total suspended solids	6	83	18.33	mg/L	42.20
Average Flow	94	100	2,122.84	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.7
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
COOLING WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	10	100	45.90	mg/L	1,914.27
Hydrogen ion (pH)	10	100	7.09		
Specific conductance	10	100	1,871.70	µS/cm	
Total suspended solids	10	70	8.43	mg/L	372.06
Average Flow	280	100	39,914.56	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.8
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
COOLING WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
DOC	8	100	8.39	mg/L	61.74
Hydrogen ion (pH)	7	100	6.46		
Specific conductance	7	100	80.40	µS/cm	
Total suspended solids	3	33	1.75	mg/L	22.30
Average Flow	230	100	3,839.58	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.9
JAMES RIVER-MARATHON LTD.
COOLING WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	50	10.08	mg/L	169.35
Hydrogen ion (pH)	12	100	7.56		
Specific conductance	12	100	129.17	µS/cm	
Total suspended solids	12	8	2.43	mg/L	42.63
Average Flow	355	100	18,855.06	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.10
JAMES RIVER-MARATHON LTD.
COOLING WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	11	45	10.36	mg/L	6.93
Hydrogen ion (pH)	11	100	7.29		
Specific conductance	11	100	117.64	µS/cm	
Average Flow	324	100	890.19	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.11
KIMBERLY-CLARK CANADA INC., TERRACE BAY
COOLING WATER EFFLUENT (Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	17	22.21	mg/L	36.31
Hydrogen ion (pH)	12	100	7.45		
Specific conductance	12	92	101.33	µS/cm	
Average Flow	363	100	1,635.00	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.12
MALETTE KRAFT PULP AND POWER
COOLING WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	6	100	40.00	mg/L	1,385.11
Hydrogen ion (pH)	6	100	7.40		
Specific conductance	6	100	118.67	µS/cm	
Total suspended solids	5	80	9.68	mg/L	352.71
Average Flow	163	100	36,053.07	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.13
STRATHCONA PAPER COMPANY
COOLING WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	100	41.42	mg/L	86.25
Hydrogen ion (pH)	12	100	7.99		
Specific conductance	12	100	322.33	µS/cm	
Total suspended solids	12	67	7.04	mg/L	14.58
Average Flow	337	100	2,151.50	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.14
STRATHCONA PAPER COMPANY
COOLING WATER EFFLUENT (Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	100	49.67	mg/L	15.09
Hydrogen ion (pH)	12	100	9.26		
Specific conductance	12	100	380.83	µS/cm	
Total suspended solids	12	42	6.01	mg/L	1.84
Average Flow	337	100	309.02	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.1
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	16	100	540.54	mg/L
Hydrogen ion (pH)	14	100	5.87	
Specific conductance	14	100	950.89	µS/cm
Total suspended solids	14	100	271.86	mg/L
Average Volume Discharged	12	100	725.72	m3/dicharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.2
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON)
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	4	100	5,245.50	mg/L
Hydrogen ion (pH)	4	100	7.62	
Specific conductance	4	100	1,717.25	µS/cm
Total suspended solids	4	100	1,125.00	mg/L
Average Volume Discharged	4	100	53.25	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.3
DOMTAR INC., FINE PAPERS DIVISION (ST. CATHARINES)
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	23.00	mg/L
Hydrogen ion (pH)	1	100	7.00	
Specific conductance	1	100	425.00	µS/cm
Total suspended solids	1	100	30.00	mg/L
Average Volume Discharged	1	100	418.08	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.4
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	16	100	32.11	mg/L
Hydrogen ion (pH)	16	100	6.22	
Specific conductance	16	100	251.31	µS/cm
Total suspended solids	15	100	48.37	mg/L
Average Flow	30	100	5,656.99	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.5
KIMBERLY-CLARK CANADA INC., ST. CATHARINES
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	4	100	663.75	mg/L
Hydrogen ion (pH)	4	100	6.97	
Specific conductance	4	100	351.00	µS/cm
Total suspended solids	4	100	433.50	mg/L
Average Volume Discharged	4	100	304.10	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.6
KIMBERLY-CLARK CANADA INC., TERRACE BAY
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	465.70	mg/L
Hydrogen ion (pH)	3	100	10.53	
Specific conductance	3	100	2,870.00	µS/cm
Total suspended solids	3	100	158.00	mg/L
Average Volume Discharged	3	100	401.97	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.7
NORANDA FOREST INC., RECYCLED PAPERS
EMERGENCY OVERFLOW EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	15	100	105.33	mg/L
Hydrogen ion (pH)	11	100	7.97	
Specific conductance	15	100	710.00	µS/cm
Total suspended solids	11	100	1,357.53	mg/L
Average Volume Discharged	1	100	263.00	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.8
NORANDA FOREST INC., RECYCLED PAPERS
EMERGENCY OVERFLOW EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	3	100	87.00	mg/L
Hydrogen ion (pH)	1	100	7.73	
Specific conductance	3	100	893.33	µS/cm
Total suspended solids	1	100	317.00	mg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.9
ST. MARYS PAPER INC.
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	178	100	3,006.24	mg/L
Hydrogen ion (pH)	180	100	7.03	
Specific conductance	180	100	306.15	µS/cm
Total suspended solids	179	100	1,886.70	mg/L
Average Volume Discharged	182	100	277.11	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 6.1
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
BACKWASH EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	10	90	12,536.94	µg/L
DOC	11	100	5.81	mg/L
Hydrogen ion (pH)	11	100	6.75	
Total suspended solids	11	100	148.18	mg/L
Average Volume Discharged	11	100	69.19	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 6.2
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
BACKWASH EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	12	100	7.30	mg/L
Hydrogen ion (pH)	12	100	6.20	
Total suspended solids	12	75	15.78	mg/L
Average Volume Discharged	12	100	371.01	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 6.3
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
BACKWASH EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	10	100	46.50	mg/L
Hydrogen ion (pH)	12	100	7.12	
Total suspended solids	12	17	6.33	mg/L
Average Volume Discharged	12	100	17,584.67	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 7.1
ABITIBI-PRICE INC., THUNDER BAY DIVISION
WASTE DISPOSAL SITE EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	9	100	.78	mg/L
Ammonia plus Ammonium	9	11	.18	mg/L
BOD, 5 day, Total Demand	9	100	353.78	mg/L
Chlorodehydroabietic Acid	9	33	.00	mg/L
Dehydroabietic Acid	9	100	1.55	mg/L
Hydrogen ion (pH)	9	100	6.78	
Isopimaric Acid	9	89	.55	mg/L
Levopimaric Acid	9	100	15.91	mg/L
Neoabietic Acid	9	78	.12	mg/L
Oleic Acid	9	22	.01	mg/L
Phenol	9	100	15.48	µg/L
Pimaric Acid	9	89	.12	mg/L
Total Kjeldahl Nitrogen	9	89	1.83	mg/L
Total phosphorus	9	100	.52	mg/L
Total suspended solids	9	100	26.87	mg/L
m-Cresol	9	100	19.01	µg/L
p-Cresol	9	89	37.32	µg/L
Average Flow	182	100	354.17	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 8.1
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	1	100	21.00	mg/L
Dehydroabietic Acid	1	100	.03	mg/L
Hydrogen ion (pH)	1	100	7.11	
Total suspended solids	1	100	29.00	mg/L
Average Volume Discharge	1	100	578.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.2
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	1	100	18.30	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	.14	mg/L
Hydrogen ion (pH)	1	100	7.23	
Isopimaric Acid	1	100	.04	mg/L
Oleic Acid	1	100	.02	mg/L
Pimaric Acid	1	100	.03	mg/L
Total suspended solids	1	100	13.00	mg/L
Average Volume Discharged	1	100	537.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.3
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.09	mg/L
BOD, 5 day, Total Demand	2	100	96.50	mg/L
Chlorodehydroabietic Acid	2	50	.04	mg/L
DOC	2	100	102.00	mg/L
Dehydroabietic Acid	2	100	1.78	mg/L
Hydrogen ion (pH)	2	100	7.31	
Isopimaric Acid	2	100	.08	mg/L
Neoabietic Acid	2	50	.01	mg/L
Oleic Acid	2	50	.02	mg/L
Phenol	2	50	3.55	µg/L
Pimaric Acid	2	100	.04	mg/L
Specific conductance	2	100	480.50	µS/cm
Total suspended solids	2	100	80.00	mg/L
m-Cresol	2	50	8.52	µg/L
p-Cresol	2	50	7.93	µg/L
Average Volume Discharged	2	100	48.18	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.4
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.01	mg/L
BOD, 5 day, Total Demand	2	100	207.50	mg/L
DOC	2	100	220.00	mg/L
Dehydroabietic Acid	2	100	2.10	mg/L
Hydrogen ion (pH)	2	100	7.67	
Isopimaric Acid	2	50	.05	mg/L
Levopimaric Acid	2	50	.01	mg/L
Oleic Acid	2	50	.02	mg/L
Phenol	2	50	2.65	µg/L
Pimaric Acid	2	50	.03	mg/L
Specific conductance	2	100	808.00	µS/cm
Total suspended solids	2	100	880.00	mg/L
Average Volume Discharged	2	100	216.15	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.5
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
STORM WATER EFFLUENT (Control Point 1000)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	2	100	915.00	µg/L
BOD, 5 day, Total Demand	2	100	14.15	mg/L
Chlorodehydroabietic Acid	2	50	.01	mg/L
DOC	2	100	20.70	mg/L
Dehydroabietic Acid	2	50	.02	mg/L
Hydrogen ion (pH)	2	100	7.50	
Mercury	2	50	.11	µg/L
Nickel	2	50	33.65	µg/L
Oleic Acid	2	50	.52	mg/L
Specific conductance	2	100	875.50	µS/cm
Total Kjeldahl Nitrogen	2	50	.40	mg/L
Total suspended solids	2	100	41.00	mg/L
Zinc	2	100	49.00	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.6
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
STORM WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.01	mg/L
BOD, 5 day, Total Demand	1	100	5.00	mg/L
DOC	2	100	36.50	mg/L
Dehydroabietic Acid	2	100	.26	mg/L
Hydrogen ion (pH)	2	100	6.99	
Isopimaric Acid	2	50	.01	mg/L
Levopimaric Acid	2	50	.04	mg/L
Specific conductance	2	100	653.00	µS/cm
Total suspended solids	2	100	953.00	mg/L
Average Volume Discharged	2	100	2,894.52	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.7
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.01	mg/L
BOD, 5 day, Total Demand	2	100	17.50	mg/L
Dehydroabietic Acid	2	50	.11	mg/L
Hydrogen ion (pH)	2	100	6.98	
Isopimaric Acid	2	100	.02	mg/L
Levopimaric Acid	2	50	.04	mg/L
Oleic Acid	2	50	.01	mg/L
Total suspended solids	2	100	111.50	mg/L
Average Volume Discharged	2	100	2,775.30	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.8
ABITIBI-PRICE INC., THUNDER BAY DIVISION
STORM WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Hydrogen ion (pH)	2	100	7.60	
Oleic Acid	2	50	.03	mg/L
Total suspended solids	2	50	5.70	mg/L
Average Volume Discharged	2	100	370.80	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.9
ABITIBI-PRICE INC., THUNDER BAY DIVISION
STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.03	mg/L
BOD, 5 day, Total Demand	2	100	75.50	mg/L
DOC	2	100	72.50	mg/L
Dehydroabietic Acid	2	100	.30	mg/L
Hydrogen ion (pH)	2	100	7.15	
Isopimaric Acid	2	50	.03	mg/L
Levopimaric Acid	2	50	.01	mg/L
Oleic Acid	2	50	.06	mg/L
Pimaric Acid	2	100	.03	mg/L
Total suspended solids	2	100	69.05	mg/L
Average Volume Discharged	2	100	74.75	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.10
BOISE CASCADE CANADA LTD., FORT FRANCES
STORM WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.02	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.05	mg/L
Hydrogen ion (pH)	2	100	7.05	
Isopimaric Acid	2	100	.02	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	10.00	mg/L
Average Volume Discharged	2	100	210.24	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.11
BOISE CASCADE CANADA LTD., FORT FRANCES STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.06	mg/L
BOD, 5 day, Total Demand	2	100	14.95	mg/L
COD	2	50	22.00	mg/L
Chlorodehydroabietic Acid	2	100	.06	mg/L
Dehydroabietic Acid	2	100	.40	mg/L
Hydrogen ion (pH)	2	100	7.20	
Isopimaric Acid	2	100	.08	mg/L
Levopimaric Acid	2	100	.02	mg/L
Neoabietic Acid	2	100	.02	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.02	mg/L
Specific conductance	2	100	36.00	µS/cm
Total suspended solids	2	100	10.00	mg/L
Average Volume Discharged	2	100	534.15	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.12
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
Aluminum	2	100	420.00	µg/L
BOD, 5 day, Total Demand	2	100	40.15	mg/L
COD	2	100	660.00	mg/L
Cadmium	2	50	2.30	µg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.06	mg/L
Hydrogen ion (pH)	2	100	7.56	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Molybdenum	2	100	22.25	µg/L
Neoabietic Acid	2	100	.01	mg/L
Nickel	2	50	21.90	µg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	100	20.10	µg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	960.00	µS/cm
Thallium	2	100	30.00	µg/L
Total suspended solids	2	100	42.40	mg/L
Zinc	2	100	164.10	µg/L
o-Cresol	2	50	8.44	µg/L
Average Volume Discharged	2	100	17,200.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.13
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	2	100	1,135.00	µg/L
Ammonia plus Ammonium	2	50	.28	mg/L
Benzo(g,h,i)perylene	2	100	1.70	µg/L
Benzo(k)fluoranthene	2	100	.80	µg/L
COD	2	50	19.50	mg/L
Copper	2	100	34.50	µg/L
Dibenz(a,h)anthracene	2	100	1.40	µg/L
Hydrogen ion (pH)	2	100	7.55	
Specific conductance	2	100	50.00	µS/cm
Total Kjeldahl Nitrogen	2	100	2.03	mg/L
Average Volume Discharged	2	100	3,050.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.14
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
STORM WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	50	6.25	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.38	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	35.60	mg/L
Average Volume Discharged	2	100	2,550.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.15
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	100	13.10	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.08	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.03	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	123.60	mg/L
Average Volume Discharged	2	100	366.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.16
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	2.15	mg/L
BOD, 5 day, Total Demand	2	100	485.00	mg/L
Chlorodehydroabietic Acid	2	100	.23	mg/L
Dehydroabietic Acid	2	100	3.50	mg/L
Hydrogen ion (pH)	2	100	5.78	
Isopimaric Acid	2	100	1.75	mg/L
Levopimaric Acid	2	100	1.05	mg/L
Neoabietic Acid	2	100	.84	mg/L
Oleic Acid	2	100	1.80	mg/L
Phenol	2	50	182.13	µg/L
Pimaric Acid	2	100	.90	mg/L
Total suspended solids	2	100	1,163.00	mg/L
o-Cresol	2	50	8.24	µg/L
Average Volume Discharged	2	100	366.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.17
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
4-Nitrophenol	3	33	1.53	µg/L
Abietic Acid	3	100	.05	mg/L
BOD, 5 day, Total Demand	3	100	11.85	mg/L
Chlorodehydroabietic Acid	3	100	.03	mg/L
Dehydroabietic Acid	3	100	.11	mg/L
Hydrogen ion (pH)	3	100	6.62	
Isopimaric Acid	3	100	.04	mg/L
Levopimaric Acid	3	100	.01	mg/L
Neoabietic Acid	3	100	.02	mg/L
Oleic Acid	3	100	.06	mg/L
Pimaric Acid	3	100	.01	mg/L
Total suspended solids	3	100	208.67	mg/L
Average Volume Discharged	3	100	1,005.67	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.18
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY STORM WATER EFFLUENT (Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1-Methylnaphthalene	2	50	6.80	µg/L
2-Methylnaphthalene	2	50	10.95	µg/L
Aluminum	2	100	25,097.50	µg/L
Benzo(g,h,i)perylene	2	100	1.70	µg/L
Benzo(k)fluoranthene	2	100	.80	µg/L
COD	2	100	749.00	mg/L
Cadmium	2	50	13.30	µg/L
Chromium	2	50	76.50	µg/L
Cobalt	2	50	39.00	µg/L
Copper	2	100	108.50	µg/L
Dibenz(a,h)anthracene	2	100	1.40	µg/L
Fluoranthene	2	50	2.62	µg/L
Fluorene	2	50	4.57	µg/L
Hydrogen ion (pH)	2	100	7.47	
Lead	2	50	45.00	µg/L
Mercury	2	50	.07	µg/L
Molybdenum	2	100	32.25	µg/L
Naphthalene	2	50	1.55	µg/L
Nickel	2	50	63.90	µg/L
Phenanthrene	2	50	3.25	µg/L
Pyrene	2	50	3.10	µg/L
Specific conductance	2	50	707.42	µS/cm
Thallium	2	100	37.50	µg/L
Total Kjeldahl Nitrogen	2	50	7.64	mg/L
Total suspended solids	2	100	1,362.80	mg/L
Vanadium	2	50	74.90	µg/L
Zinc	2	100	137.40	µg/L
Average Volume Discharged	2	100	175.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.19
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT (Control Point 0700)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	3	100	.03	mg/L
Aluminum	3	100	1,335.00	µg/L
COD	3	100	373.00	mg/L
Chlorodehydroabietic Acid	3	100	.06	mg/L
Chromium	3	33	19.93	µg/L
Copper	3	67	10.67	µg/L
Dehydroabietic Acid	3	100	.70	mg/L
Hydrogen ion (pH)	3	100	7.54	
Isopimaric Acid	3	100	.07	mg/L
Levopimaric Acid	3	100	.01	mg/L
Molybdenum	3	67	24.50	µg/L
Neoabietic Acid	3	100	.01	mg/L
Nickel	3	67	37.33	µg/L
Oleic Acid	3	100	.01	mg/L
Phenol	3	33	1.21	µg/L
Pimaric Acid	3	100	.02	mg/L
Specific conductance	3	100	2,131.00	µS/cm
Thallium	3	33	21.67	µg/L
Total suspended solids	3	100	471.73	mg/L
Vanadium	3	33	29.00	µg/L
Zinc	3	100	15.40	µg/L
Average Volume Discharged	3	100	796.67	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.20
DOMTAR INC., CONTAINERBOARD DIVISION (RED ROCK)
STORM WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.03	mg/L
BOD, 5 day, Total Demand	2	100	37.00	mg/L
COD	2	100	131.50	mg/L
Chlorodehydroabietic Acid	2	100	.02	mg/L
Dehydroabietic Acid	2	100	.17	mg/L
Hydrogen ion (pH)	2	100	7.76	
Isopimaric Acid	2	100	.02	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.04	mg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	100	24.95	µg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	828.00	µS/cm
Total suspended solids	2	100	30.50	mg/L
Average Volume Discharged	2	100	383.90	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.21
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON) STORM WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	490.00	mg/L
Hydrogen ion (pH)	1	100	8.50	
Specific conductance	1	100	820.00	µS/cm
Total suspended solids	1	100	1,330.00	mg/L
Average Volume Discharged	1	100	498.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.22
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON) STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	1	100	.06	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	.19	mg/L
Hydrogen ion (pH)	1	100	9.00	
Isopimaric Acid	1	100	.08	mg/L
Neoabietic Acid	1	100	.13	mg/L
Oleic Acid	1	100	.05	mg/L
Phenol	1	100	16.20	µg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	1	100	2,740.00	mg/L
Average Volume Discharged	1	100	163.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.23
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON) STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
COD	2	100	1,434.00	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.02	mg/L
Hydrogen ion (pH)	2	100	7.95	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	100	460.60	µg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	2,060.00	µS/cm
Total suspended solids	2	100	145.00	mg/L
o-Cresol	2	100	9.70	µg/L
Average Volume Discharged	2	100	113.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.24
DOMTAR INC., FINE PAPERS DIVISION (CORNWALL) STORM WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	1	100	305.00	mg/L
Chlorodehydroabietic Acid	2	100	.02	mg/L
Dehydroabietic Acid	2	100	.02	mg/L
Hydrogen ion (pH)	2	100	7.24	
Levopimaric Acid	1	100	.01	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	2	100	.04	mg/L
Phenol	2	50	30.00	µg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	1	100	706.00	mg/L
o-Cresol	2	50	55.50	µg/L
Average Volume Discharged	1	100	406.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.25
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
2,4,6-Trichlorophenol	3	33	.85	µg/L
Abietic Acid	3	100	.48	mg/L
BOD, 5 day, Total Demand	3	100	15.67	mg/L
Chlorodehydroabietic Acid	3	67	.02	mg/L
DOC	3	100	42.47	mg/L
Dehydroabietic Acid	3	100	1.28	mg/L
Hydrogen ion (pH)	3	100	10.60	
Isopimaric Acid	3	100	.36	mg/L
Levopimaric Acid	3	100	.13	mg/L
Neoabietic Acid	3	33	.04	mg/L
Oleic Acid	3	67	.22	mg/L
Phenol	3	67	128.60	µg/L
Pimaric Acid	3	100	.17	mg/L
Specific conductance	3	100	860.00	µS/cm
Total suspended solids	3	100	143.33	mg/L
Average Volume Discharged	3	100	5.66	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.26
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
2,3,4,5-Tetrachlorophenol	3	33	313.36	µg/L
Abietic Acid	3	100	.49	mg/L
BOD, 5 day, Total Demand	3	100	608.33	mg/L
Chlorodehydroabietic Acid	3	100	.03	mg/L
Dehydroabietic Acid	3	100	1.50	mg/L
Hydrogen ion (pH)	3	100	6.33	
Isopimaric Acid	3	100	.63	mg/L
Levopimaric Acid	3	100	.20	mg/L
Neoabietic Acid	3	67	.03	mg/L
Oleic Acid	3	100	1.72	mg/L
Phenol	3	100	259.00	µg/L
Pimaric Acid	3	100	.16	mg/L
Total suspended solids	3	100	13,326.33	mg/L
m-Cresol	3	100	72.67	µg/L
o-Cresol	3	100	70.07	µg/L
p-Cresol	3	100	16.03	µg/L
Average Volume Discharged	3	100	15.93	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.27
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	102.00	mg/L
Hydrogen ion (pH)	2	100	7.61	
Specific conductance	2	100	240.00	µS/cm
Total suspended solids	2	100	109.50	mg/L
Average Volume Discharged	2	100	71.75	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.28
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Hydrogen ion (pH)	2	100	7.48	
Oleic Acid	2	100	.01	mg/L
Average Volume Discharged	2	100	1,410.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.29
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT (Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Hydrogen ion (pH)	2	100	7.42	
Oleic Acid	2	100	.01	mg/L
Total suspended solids	2	50	6.50	mg/L
Average Volume Discharged	2	100	530.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.30
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT (Control Point 0700)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	2	100	7.50	mg/L
Hydrogen ion (pH)	2	100	7.48	
Oleic Acid	2	100	.01	mg/L
Total suspended solids	2	100	175.50	mg/L
Average Volume Discharged	2	100	46.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.31
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT (Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	45.00	mg/L
Hydrogen ion (pH)	2	100	7.61	
Oleic Acid	2	100	.01	mg/L
Specific conductance	2	100	265.00	µS/cm
Total suspended solids	2	100	32.00	mg/L
Average Volume Discharged	2	100	16.85	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.32
KIMBERLY-CLARK CANADA INC., HUNTSVILLE
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	32.00	mg/L
Hydrogen ion (pH)	2	100	7.58	
Specific conductance	2	100	80.50	µS/cm
Total suspended solids	2	50	3.50	mg/L
Average Volume Discharged	2	100	170.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.33
KIMBERLY-CLARK CANADA INC., TERRACE BAY STORM WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.32	mg/L
BOD, 5 day, Total Demand	2	100	226.50	mg/L
Chlorodehydroabietic Acid	2	100	.02	mg/L
Dehydroabietic Acid	2	100	1.03	mg/L
Hydrogen ion (pH)	2	100	6.45	
Isopimaric Acid	2	100	.06	mg/L
Neoabietic Acid	2	100	.08	mg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	50	6.45	µg/L
Pimaric Acid	2	100	.05	mg/L
Total suspended solids	2	100	76.20	mg/L
o-Cresol	2	50	8.35	µg/L
Average Volume Discharged	2	100	132.20	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.34
KIMBERLY-CLARK CANADA INC., TERRACE BAY STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	392.00	mg/L
Hydrogen ion (pH)	2	100	9.14	
Specific conductance	2	50	200.25	µS/cm
Total suspended solids	2	50	694.50	mg/L
Average Volume Discharged	2	100	280.60	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.35
KIMBERLY-CLARK CANADA INC., TERRACE BAY
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	1	100	.31	mg/L
BOD, 5 day, Total Demand	2	100	114.50	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	2.24	mg/L
Hydrogen ion (pH)	2	100	10.92	
Isopimaric Acid	1	100	.19	mg/L
Neoabietic Acid	1	100	.26	mg/L
Oleic Acid	1	100	.07	mg/L
Phenol	1	100	4.70	µg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	2	100	981.60	mg/L
Average Volume Discharged	2	100	130.80	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.36
MACMILLAN-BLOEDEL LTD.
STORM WATER EFFLUENT (Control Point 1400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.10	mg/L
BOD, 5 day, Total Demand	2	100	69.00	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	2	100	.07	mg/L
Hydrogen ion (pH)	2	100	6.94	
Isopimaric Acid	1	100	.01	mg/L
Levopimaric Acid	2	100	.12	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	2	100	.08	mg/L
Pimaric Acid	2	100	.05	mg/L
Total suspended solids	2	100	15.50	mg/L
Average Volume Discharged	2	100	1,275.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.37
MACMILLAN-BLOEDEL LTD.
STORM WATER EFFLUENT (Control Point 2300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	1	100	.01	mg/L
BOD, 5 day, Total Demand	2	100	143.50	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	.01	mg/L
Hydrogen ion (pH)	2	100	6.33	
Isopimaric Acid	1	100	.01	mg/L
Levopimaric Acid	1	100	.01	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	1	100	.01	mg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	2	100	158.00	mg/L
Average Volume Discharged	2	100	459.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.38
MALETTE KRAFT PULP AND POWER
STORM WATER EFFLUENT (Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	230.00	mg/L
Hydrogen ion (pH)	1	100	7.80	
Specific conductance	1	100	1,440.00	µS/cm
Total suspended solids	1	100	158.00	mg/L
Average Volume Discharged	1	100	3.20	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.39
MALETTE KRAFT PULP AND POWER
STORM WATER EFFLUENT (Control Point 0900)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Chlorodehydroabietic Acid	1	100	.02	mg/L
Dehydroabietic Acid	1	100	.57	mg/L
Isopimaric Acid	1	100	.02	mg/L
Oleic Acid	1	100	1.42	mg/L
Phenol	1	100	22.00	µg/L
Pimaric Acid	1	100	.02	mg/L
m-Cresol	1	100	24.00	µg/L
p-Cresol	1	100	43.00	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.40
MALETTE KRAFT PULP AND POWER
STORM WATER EFFLUENT (Control Point 1000)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	2	100	52.50	mg/L
COD	2	100	126.00	mg/L
Chlorodehydroabietic Acid	1	100	.02	mg/L
Dehydroabietic Acid	2	100	43.79	mg/L
Hydrogen ion (pH)	2	100	7.55	
Isopimaric Acid	1	100	.02	mg/L
Oleic Acid	2	100	58.71	mg/L
Phenol	1	100	22.00	µg/L
Pimaric Acid	1	100	.02	mg/L
Specific conductance	2	100	1,510.00	µS/cm
Total suspended solids	2	100	257.50	mg/L
m-Cresol	2	50	12.50	µg/L
p-Cresol	1	100	4.30	µg/L
Average Volume Discharged	2	100	61.95	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.41
ST. MARYS PAPER INC.
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	2	100	12.50	mg/L
Dehydroabietic Acid	2	50	.01	mg/L
Hydrogen ion (pH)	2	100	7.63	
Oleic Acid	2	50	.10	mg/L
Total suspended solids	2	100	92.00	mg/L
Average Volume Discharged	2	100	229.10	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.42
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT (Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	27.00	mg/L
Hydrogen ion (pH)	2	100	7.63	
Specific conductance	2	100	757.00	µS/cm
Total suspended solids	2	50	10.50	mg/L
Average Volume Discharged	2	100	664.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.43
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT (Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	2	100	170.00	µg/L
COD	2	100	123.00	mg/L
Chromium	2	50	20.00	µg/L
Hydrogen ion (pH)	2	100	7.30	
Mercury	2	50	.17	µg/L
Specific conductance	2	100	840.50	µS/cm
Total Kjeldahl Nitrogen	2	50	.74	mg/L
Total suspended solids	2	100	17.00	mg/L
Zinc	2	50	10.00	µg/L
Average Volume Discharged	2	100	89.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.44
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT (Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	50	89.05	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.37	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	16.00	mg/L
Average Volume Discharged	2	100	1,375.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.45
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT (Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
COD	2	100	63.50	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.62	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	609.00	µS/cm
Total suspended solids	2	50	7.00	mg/L
Average Volume Discharged	2	100	1,243.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.46
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT (Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	100	91.40	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.63	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Average Volume Discharged	2	100	211.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 9.1
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2-Dichloroethane	10	50	.66	µg/L
Abietic Acid	10	50	.02	mg/L
Aluminum	46	100	606.09	µg/L
BOD, 5 day, Total Demand	126	65	8.36	mg/L
Benzene	10	30	1.76	µg/L
Bromomethane	10	10	1.87	µg/L
Chlorodehydroabietic Acid	10	10	<.01	mg/L
Chloroform	10	80	17.37	µg/L
Chloromethane	10	10	9.98	µg/L
Chromium	10	30	14.90	µg/L
Copper	9	22	17.44	µg/L
DOC	302	100	18.40	mg/L
Dehydroabietic Acid	132	77	.05	mg/L
Hydrogen ion (pH)	301	100	7.05	
Isopimaric Acid	10	50	.04	mg/L
Mercury	10	10	.06	µg/L
Methylene chloride	10	60	10.73	µg/L
Neoabietic Acid	11	36	.26	mg/L
Nitrate+Nitrite	10	20	.14	mg/L
Octachlorodibenzo-p-dioxin	5	20	.03	ng/L
Oleic Acid	10	40	.05	mg/L
Pimaric Acid	10	20	<.01	mg/L
Specific conductance	301	100	159.42	µS/cm
Styrene	10	10	.29	µg/L
Toluene	10	30	.63	µg/L
Total Kjeldahl Nitrogen	10	50	.49	mg/L
Total suspended solids	299	69	9.67	mg/L
Zinc	46	74	14.65	µg/L
Average Flow	302	100	25,741.99	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.2
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2,4-Trichlorobenzene	11	9	<.01	µg/L
1,2-Dichloroethane	11	45	.65	µg/L
Abietic Acid	10	20	<.01	mg/L
Aluminum	48	98	3,004.08	µg/L
Benzene	11	18	.70	µg/L
Bromomethane	11	18	3.46	µg/L
Chloroform	11	36	2.50	µg/L
Chloromethane	11	27	13.38	µg/L
Chromium	11	9	8.45	µg/L
Copper	10	30	16.90	µg/L
DOC	11	100	16.51	mg/L
Dehydroabietic Acid	10	70	.14	mg/L
Hydrogen ion (pH)	334	100	7.46	
Isopimaric Acid	10	30	<.01	mg/L
Levopimaric Acid	10	30	.02	mg/L
Mercury	11	9	.07	µg/L
Methylene chloride	11	64	10.34	µg/L
Neoabietic Acid	10	10	<.01	mg/L
Nitrate+Nitrite	11	9	.20	mg/L
Oleic Acid	10	10	.02	mg/L
Phenol	11	9	.67	µg/L
Pimaric Acid	10	30	.06	mg/L
Specific conductance	285	100	113.66	µS/cm
Total Kjeldahl Nitrogen	11	36	.41	mg/L
Total phosphorus	11	9	.06	mg/L
Total suspended solids	334	99	20.08	mg/L
Vanadium	11	9	12.33	µg/L
Zinc	11	45	15.00	µg/L
p-Cresol	11	9	1.02	µg/L
Average Flow	334	100	66,483.48	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.3
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2-Dichloroethane	11	45	.65	µg/L
Abietic Acid	11	9	<.01	mg/L
Aluminum	11	82	253.64	µg/L
Benzene	11	18	.86	µg/L
Bromomethane	11	9	1.13	µg/L
Chloroform	11	27	1.35	µg/L
Copper	11	9	14.18	µg/L
Dehydroabietic Acid	11	55	.03	mg/L
Hydrogen ion (pH)	8	100	7.59	
Isopimaric Acid	11	9	<.01	mg/L
Methylene chloride	11	82	17.29	µg/L
Nitrate+Nitrite	11	100	.34	mg/L
Oleic Acid	11	18	.01	mg/L
Pimaric Acid	11	9	<.01	mg/L
Specific conductance	7	100	94.60	µS/cm
Toluene	11	27	.36	µg/L
Zinc	11	9	7.09	µg/L
m-Xylene and p-Xylene	11	9	.30	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.4
ABITIBI-PRICE INC., THUNDER BAY DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2,4-Trichlorobenzene	12	17	<.01	µg/L
1,2-Dichloroethane	11	45	.65	µg/L
Abietic Acid	11	9	<.01	mg/L
Aluminum	12	83	101.75	µg/L
Benzene	11	36	1.96	µg/L
Bromodichloromethane	11	9	.45	µg/L
Chlorodehydroabietic Acid	11	9	<.01	mg/L
Chloroform	11	73	2.70	µg/L
Chloromethane	11	9	5.23	µg/L
Copper	12	8	13.62	µg/L
Dehydroabietic Acid	11	55	.01	mg/L
Hexachlorocyclopentadiene	12	33	.01	µg/L
Hydrogen ion (pH)	10	100	6.87	
Mercury	12	8	.07	µg/L
Methylene chloride	11	55	7.25	µg/L
Nitrate+Nitrite	12	83	.30	mg/L
Oleic Acid	11	27	2.28	mg/L
Specific conductance	9	100	93.94	µS/cm
Styrene	11	9	.27	µg/L
Toluene	11	9	.33	µg/L
Zinc	12	17	14.42	µg/L
m-Xylene and p-Xylene	11	9	.30	µg/L
Average Flow	4	100	44,347.50	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.5
BEAVER WOOD FIBRE COMPANY
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	1	100	8.00	mg/L
Hydrogen ion (pH)	1	100	18.00	
Total suspended solids	195	74	9.85	mg/L
Average Flow	260	100	14,225.65	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.6
DOMTAR INC., FINE PAPERS DIVISION (CORNWALL)
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	1	100	40.00	µg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Copper	1	100	2,510.00	µg/L
Dehydroabietic Acid	1	100	.01	mg/L
Dichlorodehydroabietic Ac.	1	100	.01	mg/L
Hydrogen ion (pH)	1	100	8.12	
Isopimaric Acid	1	100	.01	mg/L
Lead	1	100	170.00	µg/L
Levopimaric Acid	1	100	.01	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	1	100	.01	mg/L
Pimaric Acid	1	100	.01	mg/L
Specific conductance	1	100	288.00	µS/cm
Zinc	1	100	1,510.00	µg/L
Average Flow	1	100	117,000.00	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.7
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	3	67	129.90	µg/L
Benzene	1	100	3.70	µg/L
Dehydroabietic Acid	1	100	.03	mg/L
Mercury	1	100	.11	µg/L
Nickel	3	100	49.67	µg/L
Sulphide	1	100	.03	mg/L
Zinc	3	33	5.33	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.8
NORANDA FOREST INC., RECYCLED PAPERS
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Total suspended solids	12	100	16.33	mg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.9
STRATHCONA PAPER COMPANY
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	1	100	70.00	µg/L
COD	1	100	21.00	mg/L
Dehydroabietic Acid	1	100	.03	mg/L
Hydrogen ion (pH)	1	100	8.18	
Specific conductance	1	100	273.00	µS/cm
Vanadium	1	100	49.00	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

Table 10.1
Process Effluent Toxicity Test Results

Plant Name	Rainbow Trout	Daphnia Magna
Abitibi-Price (Fort William) (0100)	11/11	11/11
Abitibi-Price (Fort William) (0200)	11/11	11/11
Abitibi-Price (Iroquois Falls)	11/11	11/11
Abitibi-Price (Provincial)	0/6	0/11
Abitibi-Price (Thunder Bay)	12/12	12/12
Beaver Wood (Thorold)	0/12	5/12
Boise Cascade (Fort Frances)	10/12	2/8
Boise Cascade (Kenora)	12/12	11/11
CP Forest Products (Dryden)	5/14	0/11
CP Forest Products (Thunder Bay)	12/12	9/12
Domtar (Cornwall)	3/7	2/12
Domtar (Red Rock)	7/7	3/12
Domtar (St. Catharines)	1/7	3/12
Domtar (Trenton)	12/12	9/12
E.B. Eddy (Espanola)	0/7	0/12
E.B. Eddy (Ottawa)	6/12	10/12
James River Marathon (Marathon)	12/12	12/12
Kimberly-Clark (Huntsville)	0/5	0/6
Kimberly-Clark (St. Catharines)	0/8	0/12
Kimberly-Clark (Terrace Bay)	0/12	0/12
MacMillan Bloedel (Sturgeon Falls)	N/A	N/A
Malette (Smooth Rock Falls)	10/12	12/12
Noranda (Thorold)	12/12	11/12
Quebec & Ontario (Thorold)	0/5	0/8
Sonoco (Trenton)	5/12	4/12
Spruce Falls (Kapuskasing)	12/12	12/12
St. Marys (Sault St. Marie)	12/12	12/12
Strathcona (Napanee)	4/11	2/12
Total	180/278	164/304

Notes:
Results are reported as Number of Toxic Samples/Total Number of Samples.
Data for MacMillan Bloedel were invalid due to analytical problems.